NOVEMBER
1951

Chemical Engineering



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NOVEMBER
1951

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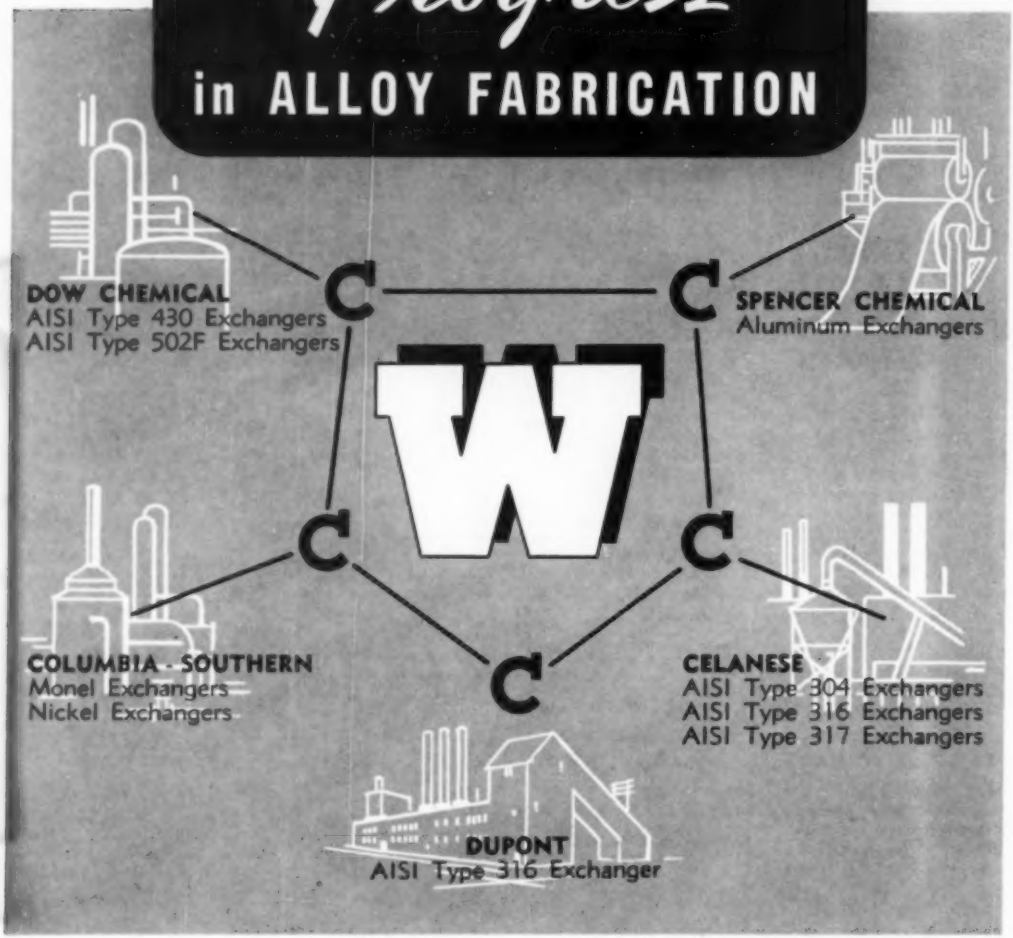
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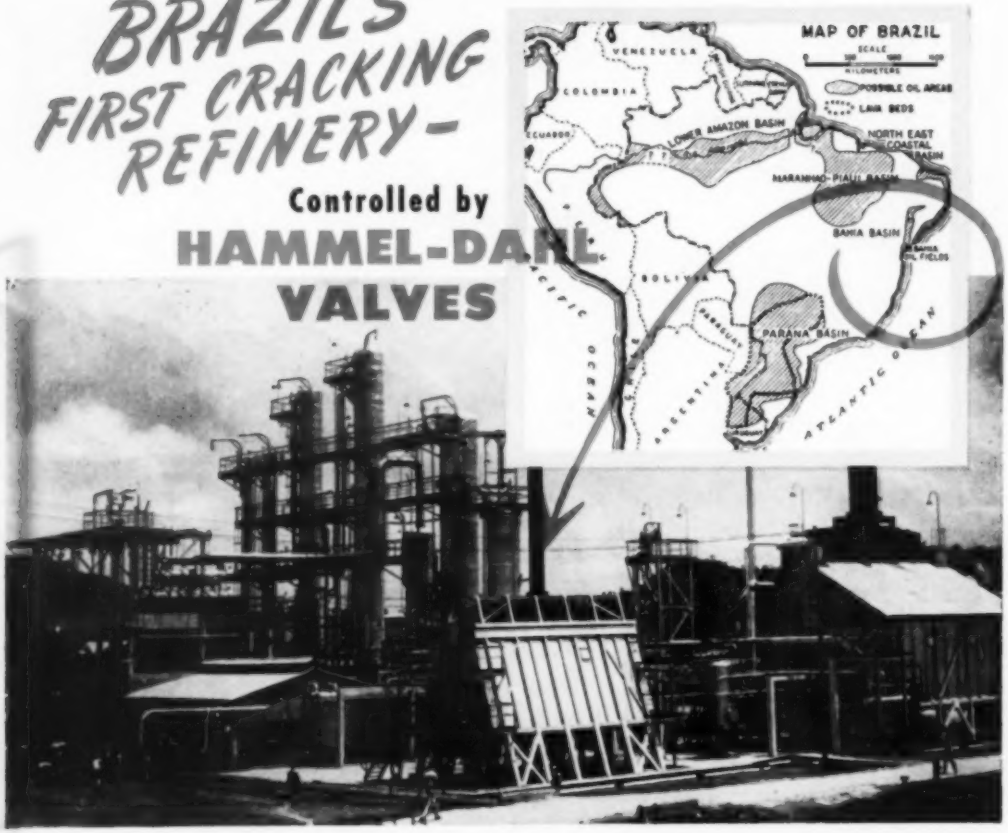
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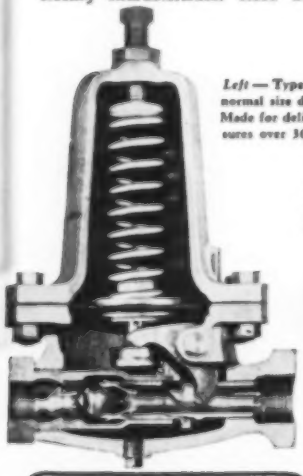
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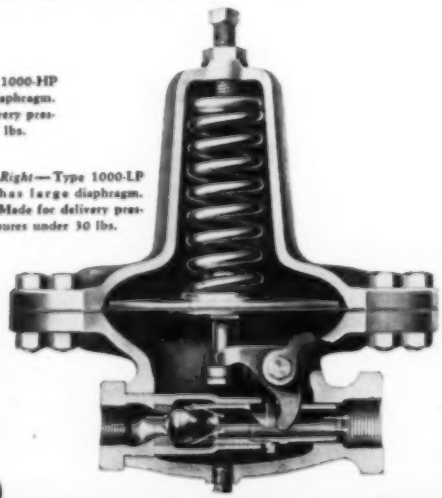
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Left — Type 1000-HP normal size diaphragm. Made for delivery pressures over 30 lbs.

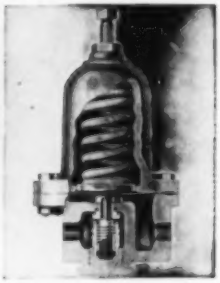


Right — Type 1000-LP has large diaphragm. Made for delivery pressures under 30 lbs.

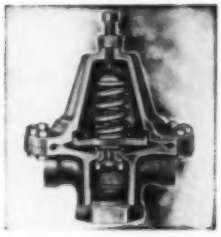
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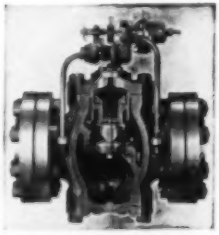
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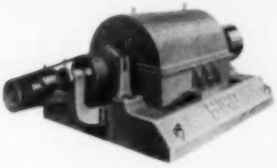


Type 8871 Pressure Regulator for dirty liquids (like Bunker C fuel oil). Inner valve is bolted to diaphragm for positive movement. Sizes ½" to 10". Bodies: iron, bronze, or steel. Seat ring and inner valve: stainless steel. Bulletin 972.



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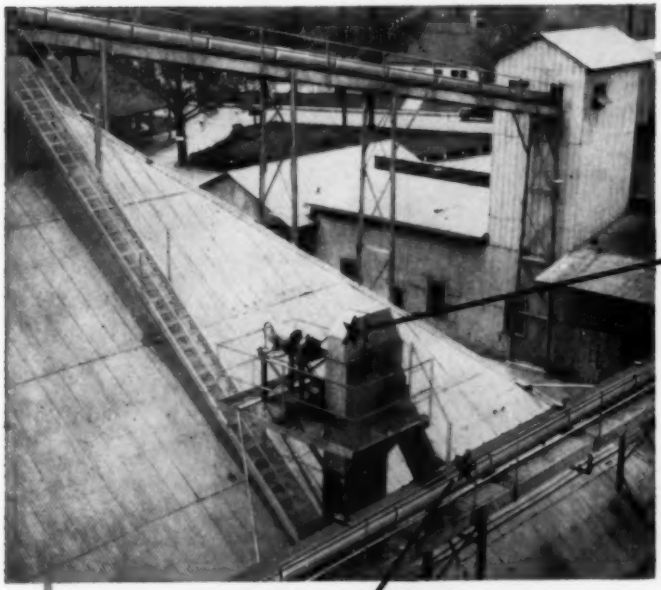
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What is a grommet?

A grommet is like a giant cable except that it's *endless*—a cord loop built up by winding heavy cord on itself. There is no overlapping cord *section* as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

All cords put to work

Each of the two grommets and every part of a grommet carry their share of the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume—and less stretch. Grommet belts stretch, on an average, only about one-third as much as ordinary belts.

Better grip, less slip

Grommet belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

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Grommet V Belts BY

B.F.Goodrich

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Dept. CE-11
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Firm Name_____

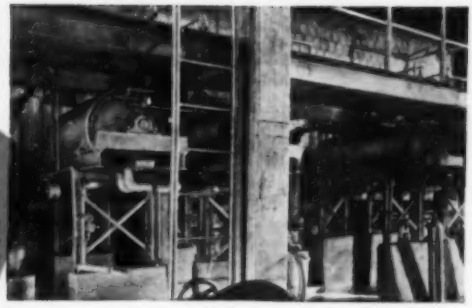
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B. foundry and machine shop facilities set up for high alloy valves *only;*

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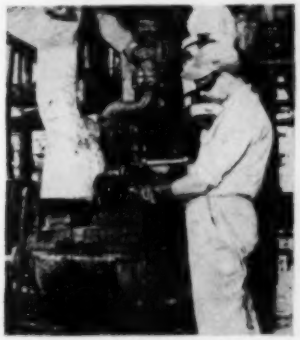
THE CORROSIVE: Asphalt resin.

THE APPLICATION: Sampling high-temperature, high-viscosity asphalt resin in processing of lubricating oil.

THE PLACE: A large oil refinery.

THE PROBLEM: Standard cast iron gate valves, traced with a 150 psi steam coil, did not provide uniform heating, which gave trouble in sampling. They became loaded with asphalt, which caused them to stick. When finally opened, a solid slug of asphalt would come through.

THE SOLUTION: ALOYCO fully jacketed gate valves. Valve body and bonnet jackets are connected to 150 psi steam and valves are completely lagged.



Steam-jacketed ALOYCO valve insures free-flowing asphalt resin sample.

THE RESULTS: ALOYCO valves have been in service since 1948, and are used daily for sampling. Since valve is heated uniformly in body and bonnet, the asphalt flows freely and sticking is eliminated.

THE BACKGROUND: The ALOYCO Corrosion Clinic offers aid on all sorts of problems—not just corrosion. If the service is one that should be handled by a corrosion-resistant valve, the problem—whether it be corrosion, contamination, discoloration, temperature extremes or proper application—is one for the Clinic.

Among all valve manufacturers, ALOYCO is the *largest* specializing in high alloy valves. We make *more* corrosion-resistant valves than anybody else.

Cut valve costs. Put your problem up to ALOYCO'S Corrosion Clinic.

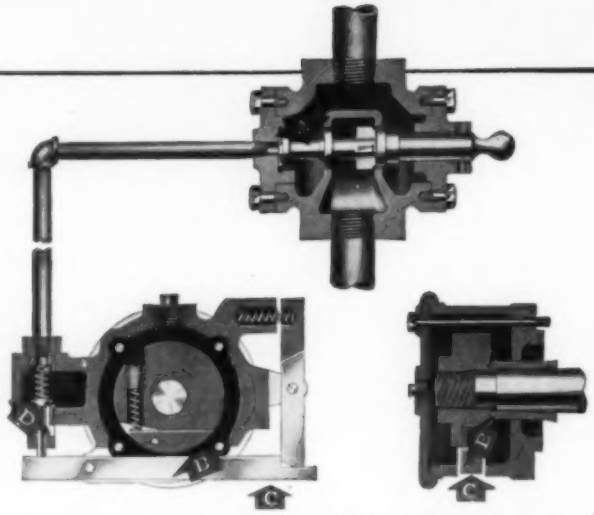
ALLOY STEEL PRODUCTS CO., INC.
1301 West Elizabeth Avenue, Linden, N. J

Longer Lasting

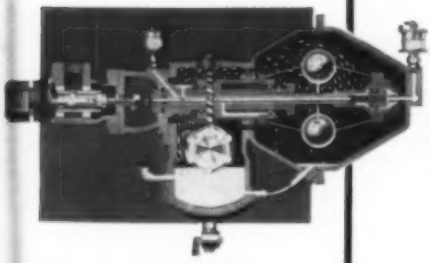
ALOYCO VALVES

1st in Corrosive Service

Only Coppus Turbines offer you *a pilot operated* excess speed safety trip



The constant speed governor on Coppus Turbines, plus this Excess Speed Safety Trip, gives you extra protection for your turbine investments. Here's how it works. When steam is turned on, pressure opens valve A fully. When excess speed is reached, centrifugal force throws weight B against lever C lifting pilot valve D. This releases pressure in back of valve A, closing this valve instantaneously, to shut off the steam. Safety trip can be tested easily while turbine is running by manually tripping and resetting lever C.



Sectional view showing lubricating system of fully enclosed Coppus Constant Speed Governor. Governor head acts directly on stem of steam admission valve. No external levers required. Ball bearing construction eliminates end play and gives frictionless operation.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

CUT YOUR COSTS PER HORSEPOWER

When you choose from the Coppus Steam Turbine line, you get the right size for your requirements . . . and make substantial savings on *any* size from the 150 hp turbine down to the smallest. Low in first cost, Coppus Turbines save you more money in the long run. Operating and maintenance costs are kept low by such other features as: large number of steam nozzles, controlled individually by manually operated valves; hard chromium plating on shaft at the stuffing box; replaceable cartridge type bearing housings; optional carbon ring packing assembly for back pressures up to 75 pounds.

WRITE FOR BULLETIN 135

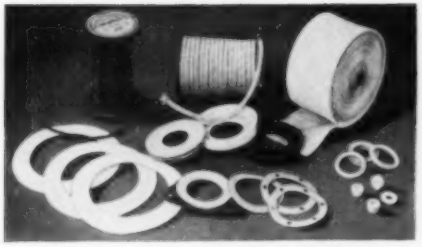
COPPUS ENGINEERING CORPORATION, 231 Park Ave., Worcester 2, Mass. Sales offices in THOMAS' REGISTER.

COPPUS "BLUE RIBBON" TURBINES

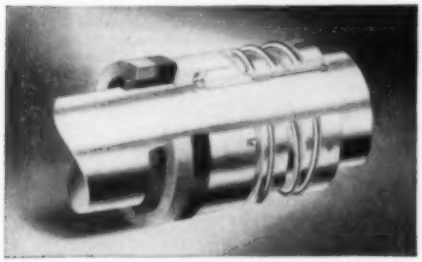
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Packings, Gaskets and Seals

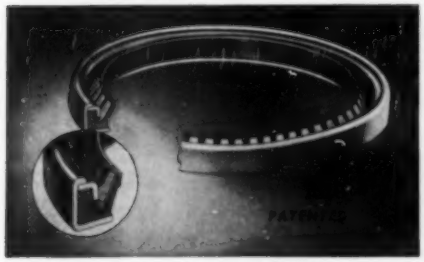
—from our expanded research program



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Garlock KLOZURE* *Oil Seal*



Research has brought advanced design, better materials and new uses for thousands of products in American industry.

Here in the completely equipped Garlock research laboratories we have developed new products and have improved our regular line of packings, gaskets and seals with new materials and better designs.

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Write for folders!

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PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

*Reg. U. S. Pat. Off.

Garlock

how to "liquidate" alien ions....



VERSENE ELIMINATES METALLIC CONTAMINATION

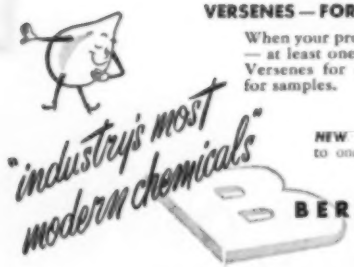
Foreign metallic ions are all enemies of industrial processing and products. They promote decomposition, rancidity, odor, coloration and cause many other undesirable reactions. Versene destroys these troublemakers by neutralizing them efficiently and economically. It does so by reacting with most metallic ions to form soluble non-ionic chelate compounds of such great strength that the alien ions are completely "liquidated", and can no longer interfere with the quality of your products and processes.

VERSENE OFFERS EXCEPTIONAL STABILITY

Completely stable in solution, Versene does not decompose in either acid or alkaline solution, or at high temperatures. It is stable and inert against attack from any chemical compound except strong oxidizing agents such as permanganate and acid dichromate. Available in dry or liquid form, the Versenes are the tetra sodium salts of Ethylene Diamine Tetra Acetic Acid and other polyamino acids. They are the most versatile and the most powerful complexing (chelating) agents known.

VERSENES — FOR QUALITY CONTROL

When your processes and products are upset by those troublemakers — *foreign metallic ions* — at least one of the seven Versenes can probably help you "liquidate" them. Call on the Versenes for *quality control.* Write Dept. B. Send for Technical Bulletin No. 2. Ask for samples.



NEW VERSENE WATER TEST KIT. Tells total hardness in 2 minutes. Accurate to one grain per gallon. Versenate Method. Complete Kit $5. postpaid.

* Trade Mark

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FRAMINGHAM, MASSACHUSETTS

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Wasatch Chemical Co., Salt Lake City, Utah
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NO WEAR FROM LINE FLUID



Bank of 8" a.c.f. Lubricated Plug Valves at the East Texas Salt Water Disposal Company's Cook Plant, Turnerstown, Texas.

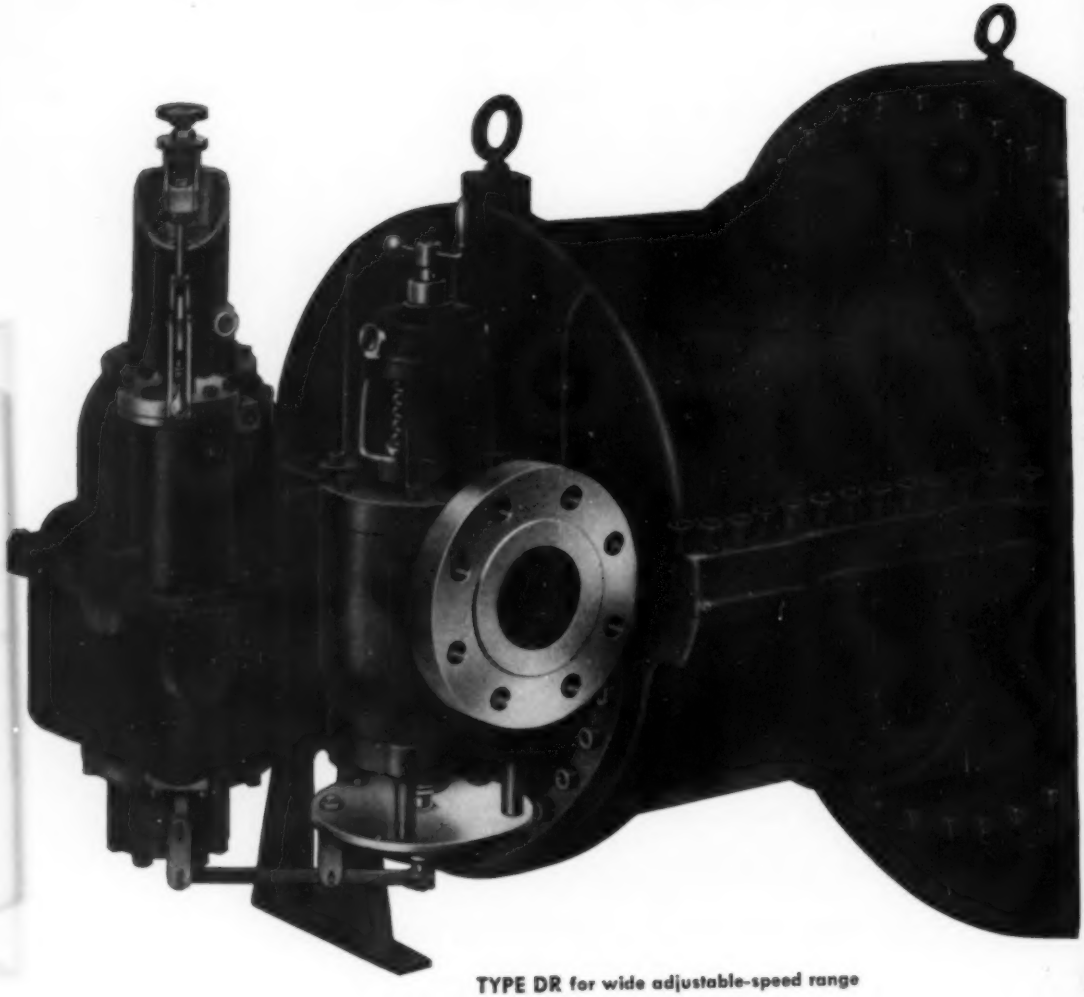
Why risk the erosive effects of flowing fluid? Actual seating and sealing surfaces of the a.c.f. Lubricated CYLINDRICAL PLUG Valve are sealed away and protected when the valve is on flow. The result is longer service life, no replacement of parts.

a.c.f. CYLINDRICAL FULL PIPE AREA **PLUG VALVES**

Representatives in 50 Principal Cities

Ask for Catalog 4CM. American Car and Foundry Company, Valve Division, 1501 East Ferry Ave., Detroit 11, Michigan

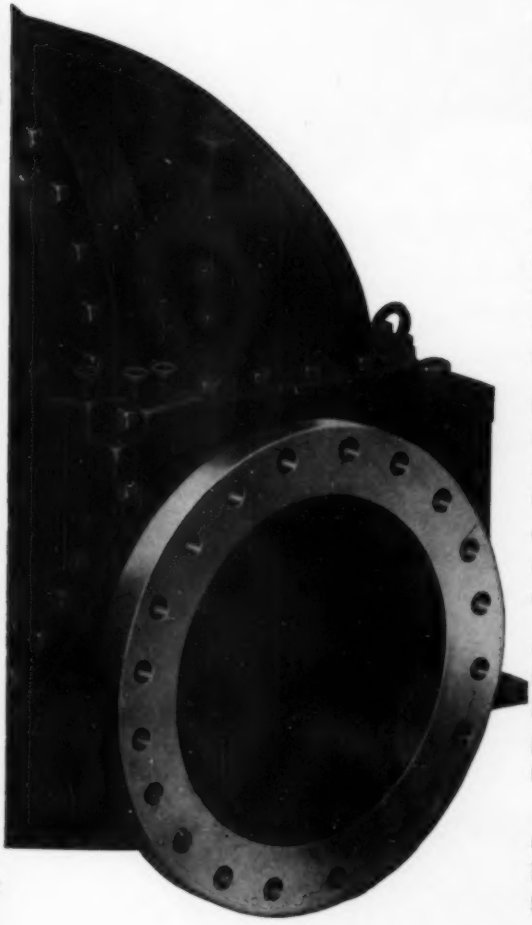
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TYPE DR for wide adjustable-speed range

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Available in Four Designs—200 to 5000 hp



Now in production! General Electric's completely new, multi-stage turbine drives . . . designed to give you maximum mechanical power for every fuel dollar . . . available to meet any mechanical drive application where efficiency and reliability are "musts."

FOUR NEW TYPES—The DP, DR, DRV, DRVX—incorporate the newest ideas in improved turbine design. Four different governing systems give you a wide selection of performance ratings for either condensing, noncondensing or automatic extraction applications.

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252-52

GENERAL ELECTRIC

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Yields Increased . . . Costs Lowered . . .
Complete Restriction of Information

For a two year period a manufacturer had worked on the problem of developing an oxidation catalyst for their own use. Their basic research was presented to a Davison Field Service Engineer as a laboratory prescription. This material was completely and confidentially coordinated with Davison's Technical Service and Research Departments. Pilot plant samples were manufactured enabling further research to be accomplished on the manufacture of the catalyst. Top men in the catalyst field worked on the development of this oxidation catalyst and after six months it was manufactured for large scale commercial use.

Because of Davison's modern facilities and extensive experience, the oxidation catalyst was produced at greatly reduced cost yet provided top yields. At no time was restricted information in danger of being divulged.

This is an example of how Davison's specialty catalyst development and production works. If you have a catalyst problem, contact the Davison Field Service Engineer. You can rely on Davison to work with you, confidentially.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

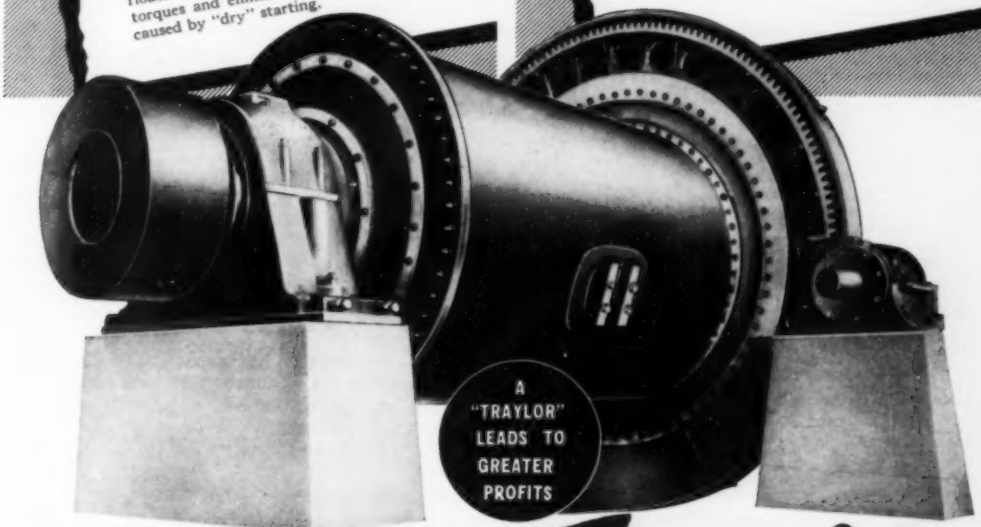
PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

Here's why a Traylor Ball Mill

needs less maintenance

HEADS are cast steel . . . faced and counter bored to fit shell flanges. Shell is of all welded steel plate construction with heavy flanges welded to each end. Flanges are faced and turned to insure proper alignment with heads. Trunnions are cast integral with the heads, *turned* and *highly polished*. Large trunnion bearings . . . of heavy ball and socket design . . . are continuously lubricated by an internal oil elevator. To save power and reduce bearing wear when starting the mill, a high pressure Alemite pump is fitted to each bearing. This pump coats the trunnion with a film of grease which lifts and floats the mill to overcome high starting torques and eliminate undue bearing wear caused by "dry" starting.

GEARS are important to ball mill operating and maintenance costs. Traylor gears mesh smoothly . . . are less subject to wear . . . minimize power waste. The main gear is furnished in halves. Both this steel main gear and the steel pinion gear are reversible. Using *both sides* of the teeth greatly lengthens gear life. The teeth are generated involute with *high* addendum on the pinion . . . low addendum on the main gear . . . on a Maag Type Automatic Gear Generator. This has been *standard* practice at Traylor for over 25 years.



As your production rate climbs...your need for a Traylor Ball Mill will grow. As your grinding costs increase, so will your need for *more productive* equipment to protect your profits. Traylor Mills are built for *continuous operation...for dependable 24 hour production* with a *minimum* of down time for maintenance. Write today if you have a grinding problem due to increased production requirements. Traylor can show you how to put your grinding operation on a *profitable* 24 hour basis.

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RESISTO PIPE AND VALVE CO.
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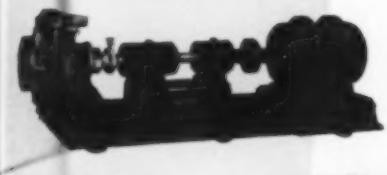
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· · Iron or Steel Body Lead Lined · ·

Resisto acid resisting valves are recognized by the Chemical and Process Industries as embodying original, advantageous features, and assuring superior performance to successfully meet the severe conditions imposed by searching and corrosive liquids.

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Resisto equipment allows hungry acids to perform only the duties for which they were originally designed.





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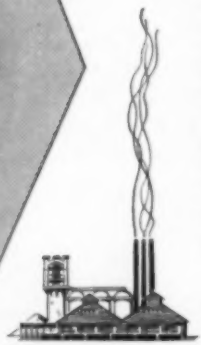


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Your YALE Representative will demonstrate the cost-cutting advantages of the rugged WORKSAVER line to you. All you have to do is name the time and place. Naturally, there is no obligation.

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YALE GAS AND ELECTRIC INDUSTRIAL TRUCKS • YALE HAND TRUCKS • YALE HAND AND ELECTRIC HOISTS

Let's look at the performance ★ of MOORE NULLMATIC

The NULLMATIC Controller was a new development in 1947. Its friction-free operation set new standards for control instruments.

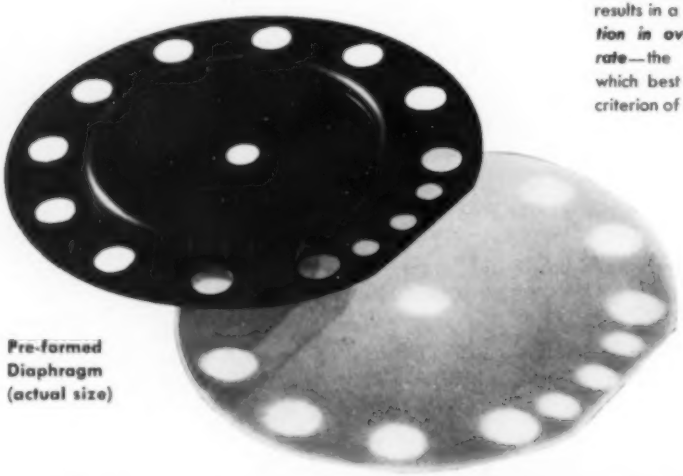
Now—***four years and 4315 Controllers later***—users here and abroad have proved the advantages of this stack-type design.

Pneumatic Force-Balance Operation
Controller lag is practically eliminated.

Simplicity of Field Maintenance
Diaphragms will withstand 100 psi. The pilot valve, restrictions, and needle valves—the only other working parts—can be removed easily, for cleaning.

Four Years of Know-How
As the result of field experience, many improvements have been made since the first production units—although *these first Controllers are still operating continuously.*

Now, the performance is further improved by the use of pre-formed diaphragms in the throttling unit. This major advancement in design results in a ***50% reduction in over-all spring rate***—the one factor which best serves as a criterion of over-all performance.



Pre-formed Diaphragm (actual size)

MOORE PRODUCTS CO., PHILADELPHIA 24

Controllers

ALL NULLMATIC Controllers meet the following performance specifications: (These values are conservative—the results of tests on standard production instruments, using 3 to 15 psi operating range and 25 psi supply pressure. Many tests have shown even better values.)

★ **RESPONSE LEVEL**
The output is sensitive to changes in the measured variable—as small as 0.01% of full range.

★ **TRACKING**
The measured variable and the control point align within 0.5% of full range.

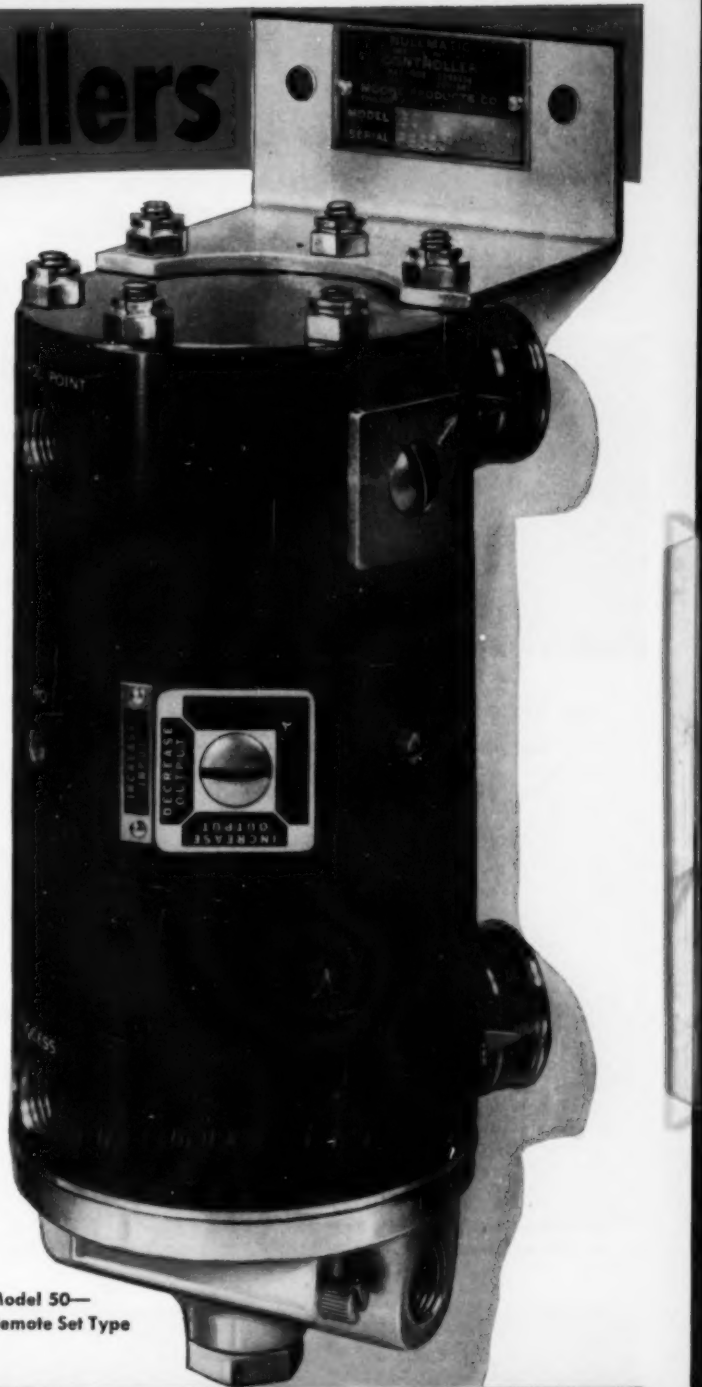
★ **REPRODUCIBILITY OF OUTPUT**
—within 0.3% of full range.

★ **AIR CONSUMPTION**
—0.2 scfm (in balance, on dead-end service).

★ **OUTPUT CAPACITY**
—up to 3 scfm.

Send for this New Catalog

Bulletin 5011 contains additional performance data and complete information on NULLMATIC Controllers, M/P Control Stations, Derivative Units, and M/F Relays for interlocking control circuits.



Model 50—Remote Set Type

Branch Offices: CHICAGO, DETROIT, HOUSTON, LOS ANGELES, PITTSBURGH

Subsidiaries: Moore Instrument Co., Ltd., TORONTO
Air Clocks, Inc., HUNTINGTON STATION, N. Y.

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with the ALL-METAL Foxboro d/p Cell!



. . . gives fastest response, longest sustained accuracy, lowest installation cost

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The Foxboro d/p Cell measures differential pressure by the force-balance principle and transmits pneumatically to indicating, recording, or controlling receivers. Small, compact, weighs as little as 19 lb. Ranges: from 25" to 800" H_2O. Working pressure ratings up to 4000 psi. Steel or stainless steel construction. Inherent over-range protection. Easy in-the-field calibration and range changes. Optionally available with pre-assembled manifold piping shown in photo above.

Thousands of d/p Cells now in use throughout industry, with many repeat orders now on our books, indicate the wide acceptance and successful performance of this revolutionary development for the measurement of liquid, steam, gas, or air flow. Write for detailed Bulletin 420. **The Foxboro Company, 3811 Neponset Avenue, Foxboro, Massachusetts, U. S. A.**

- No seal pots
- No mercury
- No leveling
- Installed at the orifice

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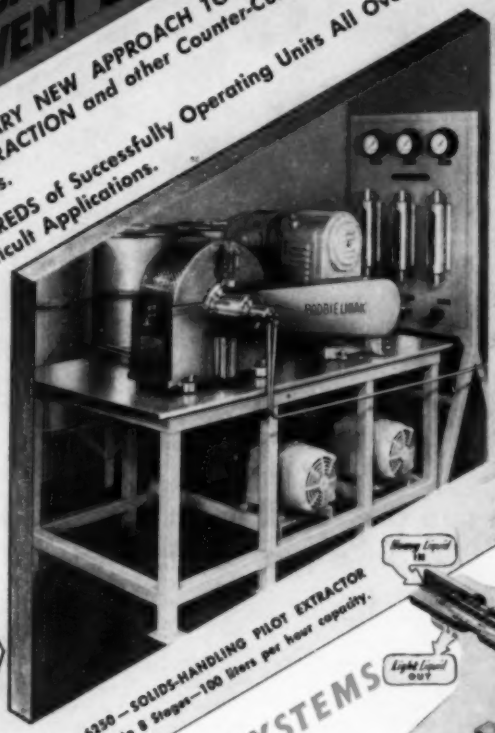
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CENTRIFUGAL MULTI-STAGE SOLVENT EXTRACTOR*

A REVOLUTIONARY NEW APPROACH TO THE ENTIRE FIELD OF SOLVENT EXTRACTION and other Counter-Current Liquid-Liquid Contacting Processes.

PROVEN BY HUNDREDS of Successfully Operating Units All Over the World on Most Difficult Applications.

NOW AVAILABLE IN SOLIDS-HANDLING DESIGNS, 1 to 15 or more Stages, from Laboratory and Pilot Size to 20,000 GPH Capacity. Extraction Plants designed to Suit your Materials and Requirements.



No. 6250 — SOLIDS-HANDLING PILOT EXTRACTOR PLANT—5 to 8 Stages—100 liters per hour capacity.

THIS PILOT PLANT WILL BE IN ACTUAL OPERATION AT OUR *Chemical Industries Exhibit Booth 281*

Distinctive FEATURES

- **EXTREMELY COMPACT** even in largest capacities.
- **DIFFICULT MATERIALS HANDLED** emulsifying, down to 0.02 density difference, with suspended solids.
- **SOLIDS HANDLING,** including many precipitates, ground tissues and fibers.
- **NEGLIGIBLE HOLDUP OF MATERIALS HANDLED,** only a few gallons.
- **SHORT CONTACT TIME, ALMOST INSTANT EQUILIBRIUM.**
- **PRESSURE TIGHT, NO AIR CONTACT.**
- **SIMPLE CONSTRUCTION AND OPERATION.**
- **CONTINUOUSLY SELF CLEANING,** easily flushed with positive cleanout devices without disassembly.



Illustration of Continuous Multi-stage Counter-Current Extraction in a PODBIELNIAK EXTRACTOR.

for LIQUID-LIQUID-SOLID SYSTEMS

- **MIXING**
- **WASHING**
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- **ACID TREATING**
- **DECOLORIZING**
- **SOLVENT EXTRACTION** one to 15 counter-current stages per unit including reflux and two-solvent fractionation

*"The extractor herein described is fully protected by United States and foreign patents and pending patent applications."

for A VARIETY OF INDUSTRIES

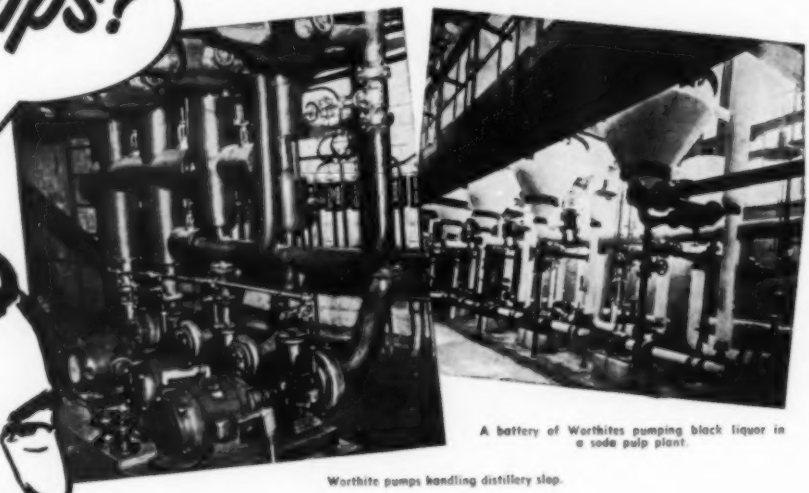
PETROLEUM • PETROCHEMICAL • ESSENTIAL OIL • INSULATING OIL • VEGETABLE OIL • PAINT AND VARNISH • FISH OIL • FOODS • DAIRY • PULP AND PAPER • LATEX • CHEMICAL • SYNTHETIC FIBER • PHARMACEUTICAL • HORMONES AND VITAMINS • BIOCHEMICAL • BREWERIES • WINERIES • DRY CLEANING • SOAP • DYES • MEAT BY-PRODUCTS • PLASTICS • ANTIBIOTICS • FRUIT JUICES AND EXTRACTS • DRUG EXTRACTS • BEVERAGES • LACQUERS AND DRYING OILS • SOLVENTS • LEATHER • FATS AND GLYCERIN • WOOL SCOURING • NUT AND SEED OILS • SYNTHETIC DETERGENTS • INK • GERMICIDES AND INSECTICIDES

Our engineers will gladly correspond regarding application of our extractors to specific processes.

PODBIELNIAK, INC. 341 EAST OHIO STREET, CHICAGO 11, ILLINOIS

Looking for evaporator pumps?





A battery of Worthites pumping black liquor in a soda pulp plant.

Worthite pumps handling distillery slop.

You can get the best in Worthington Worthite Centrifugal Pumps

By standardizing on a complete range of sizes in one superior stainless steel, Worthington can concentrate its volume and inventories. This means you can get the centrifugal pump and parts you need for handling corrosive liquids and other chemicals. Thousands of these Worthington *standard* pumps are now in evaporator service, pumping such widely varying liquids as black liquor, ammonium sulfate and frozen orange concentrate. Their advanced design and exceptional resistance to abrasion and corrosion assure best results at lowest operating cost.

FOR ALL EVAPORATOR SERVICES

Worthington has evolved a scientific method of selecting exactly the right pump for size, speed, head, capacity and NPSH. Let us show you how it works. For further facts proving *there's more worth in Worthington*, call your nearest District Office. Or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.*

TYPICAL LEADING MANUFACTURERS OF EVAPORATOR SYSTEMS USING WORTHITE PUMPS

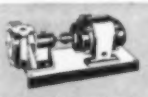
Buflovak • General American Transportation
Goslin Birmingham • Koppers
Majonnier Brothers • Struthers Wells
Swenson • Wilputte • Zaremba

WORTHINGTON

See us at the Chem. Show, Booth No. 264, Grand Central Palace, N. Y. C.

C1-1

See us at the Chem Show, Booth No. 264, Grand Central Palace, N. Y. C.



Types CG and CGL. Sizes ¾" to 10". Capacities to 5000 GPM; heads to 200 ft. Liquid ends of WORTHITE alloy.



Type CF. Sizes 1" to 4". Capacities to 1000 GPM; heads to 130 ft. Standard, all iron and all bronze.



Type CQ. Sizes 1½" to 3". Capacities to 600 GPM; heads to 130 ft. at 1750 RPM. Closed impeller. WORTHITE shaft and fittings.



Type L. Sizes 3" to 8". Capacities to 2250 GPM; heads to 300 ft. Single stage volute. For general service.

Now You Can SEE Where You Can't LOOK



This is An "Exploratory" Advertisement

Frankly, we don't know what uses there are for the "Utiliscope" (Wired Television) in the chemical industry . . . so in the adjacent ad we are simply telling you what it will do. Based on our experience in other fields, we suspect there are many places in the chemical industry where the "Utiliscope" will improve product quality, save manpower, prevent accidents or help increase production.

If you want to look into the possibilities of the "Utiliscope", simply write us for a copy of Bulletin 1025C which explains the equipment and shows various applications. Please address your request to Department "C".

DIAMOND POWER SPECIALTY CORPORATION
DEPARTMENT "C"
LANCASTER, OHIO

WITH THE

DIAMOND "UTILISCOPE"

(WIRED TELEVISION)



On "Utiliscope" receiver, operator "sees" distant or dangerous operation in comfort and safety

In industry, research, commerce, science, etc., many operations and conditions that need to be seen cannot be looked at because it is too difficult or too dangerous.

The "Utiliscope" (wired television) enables you to see where you can't look. Its camera eye can be placed in dangerous, remote or inaccessible spots and it will bring an exact image right to the operator. Moreover, several cameras can observe various parts of an operation or several related operations. Images of these directly in front of the operator enable him to accurately control the whole . . . concentrating responsibility and avoiding mistakes through erroneous information.

The "Utiliscope" saves manpower, improves product quality, increases production and prevents accidents.

The Diamond "Utiliscope" is surprisingly simple and low in cost. No special skill is needed for installation and operation. Its stability and reliability are exceptional. Ask for Bulletin 1025 which shows a wide variety of cost-cutting applications.



TYPICAL USES—Studying destructive tests of engines • Watching flow of molten steel • Checking remote gauge readings • Observing conditions inside furnaces • Viewing nuclear research • Coordinating materials flow on conveyors.

The "Utiliscope" (Reg. U.S. Pat. Office)

4593

DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO • *OFFICES IN 39 PRINCIPAL CITIES*
Diamond Specialty Limited — Windsor, Ontario

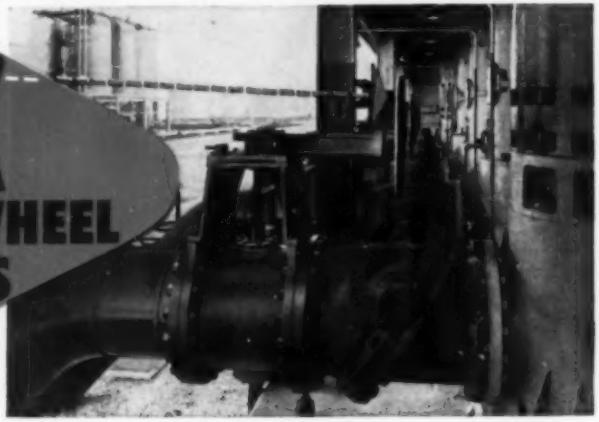
WRITE FOR BULLETIN 1025

Since 1903, Diamond has Manufactured Quality Equipment For Industry

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •

SIX HANDWHEEL TURNS



. . . Operate these R-S Valves

This installation of twenty-inch valves in the water system to one of the large oil refineries in Louisiana is another example of R-S time-saving efficiency. Such ease of operation is an important consideration in any pumping operation and especially where a battery of synchronous driven pumps discharges into a common header. Burned-out motors at start-ups can be practically eliminated.

Substantial savings in pumping power result due to the low pressure drop. The beveled vane ordinarily seated at a 12½° angle means greater control rangeability either manual or automatic and no down-time for cleaning.

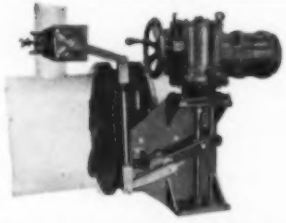
Install easily operated R-S Valves and obtain the most from your valve investment. Your local R-S representative is a valve expert—know him well.

R-S PRODUCTS CORPORATION

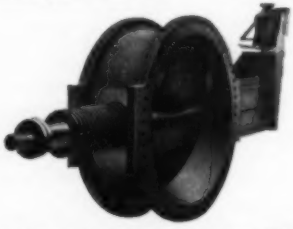
4600 Germantown Avenue, Philadelphia 44, Pa.

An S. Morgan Smith Company Subsidiary

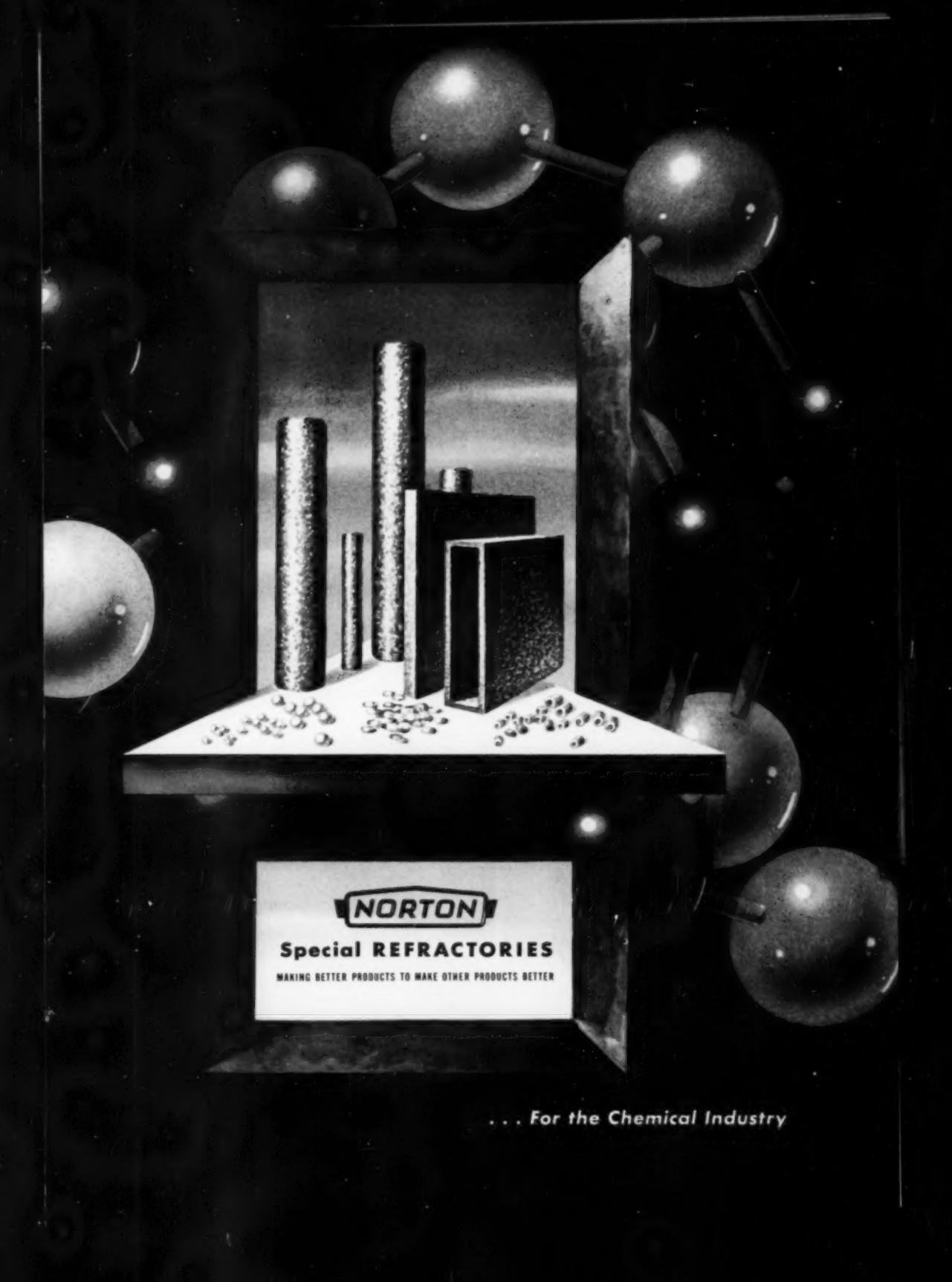
REPRESENTATIVES IN PRINCIPAL CITIES

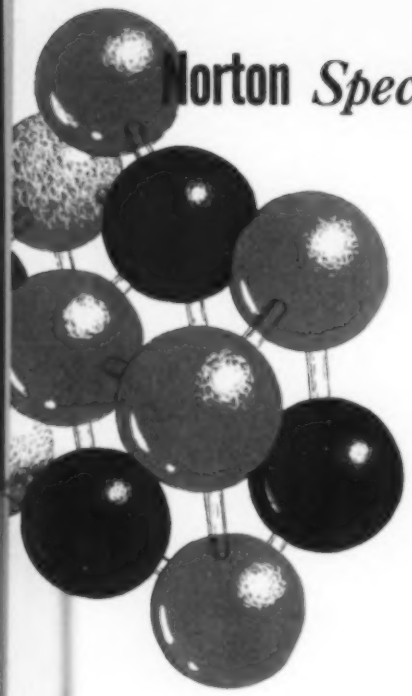


No. 798—Thirty-six inch and eight-inch R-S heavy duty valves of R-S "H" Metal at elevated temperatures for foundry cupola control. When the larger valve is wide open, the smaller valve is fully closed and vice versa. Slow operation is required, hence the motor operator with threaded reachrod.



No. 735—72-inch 125-pound "H" Metal R-S Valve for elevated temperatures. Valve is equipped with dual cooling fins. Oil cylinder and positioner utilizes 200 psig oil and 0-15 psig instrument air. Positioner cam driven simulating straight line semi-log control curve.


NORTON
Special REFRACTORIES
MAKING BETTER PRODUCTS TO MAKE OTHER PRODUCTS BETTER
. . . For the Chemical Industry



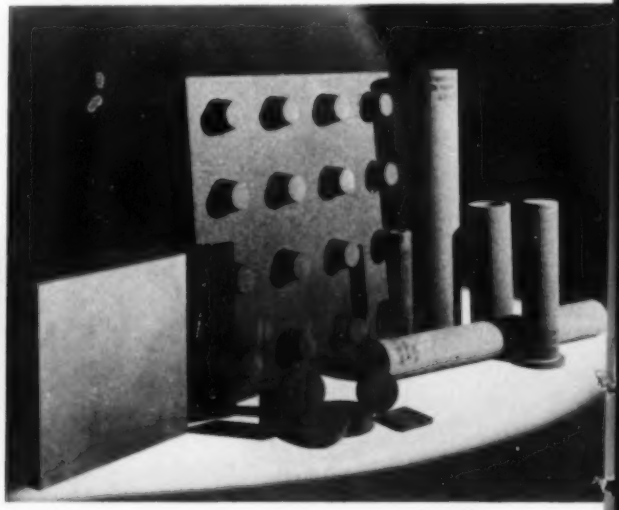
Norton *Special* Refractories Are Engineered To Fit Your Exact Requirements

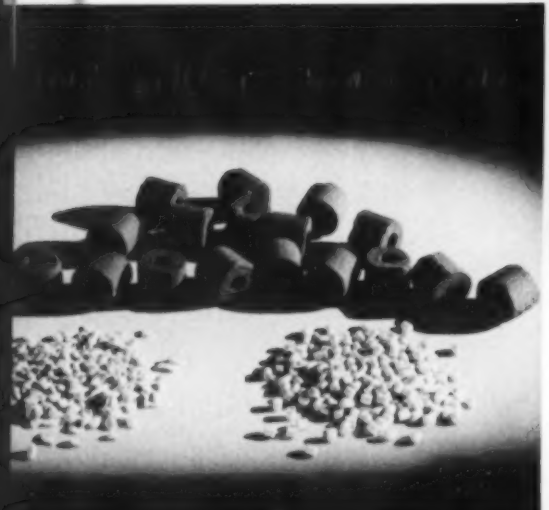
In your search for better products, increased production, and lower operating costs, you'll find a valuable partner in Norton Refractory Research.

For 40 years, Norton research has pioneered in the development of special refractories for high temperature applications that are complicated by chemical, electrical, and physical variables.

Working with many electric furnace products, Norton Research has created a wide variety of special refractories having properties of great value for the chemical industry. These are CRYSTOLON* (silicon carbide), ALUNDUM* (fused alumina), MAGNORITE* (fused magnesia), and FUSED STABILIZED ZIRCONIA. A few of these products are discussed here. For more complete information call your nearby Norton refractories engineer, or write Norton Company, Refractories Division, Worcester 6, Mass.

1. NORTON ALUNDUM CATALYST SUPPORTS are designed to give you the surface areas you require for such applications as the manufacture of phthalic anhydride, production of ammonia, and reforming of natural gas. They are made in spheres, rings, and pellets of various sizes with controlled external and internal structures suitable for coating or impregnating. Their chemical stability and purity assure end products free from contamination. More important, the supports are free from chemicals which "poison" the catalyst. Their high refractoriness and resistance to abrasion insure long life. Norton catalyst supports can also be made from MAGNORITE, FUSED STABILIZED ZIRCONIA, CRYSTOLON, and MULLITE as required.



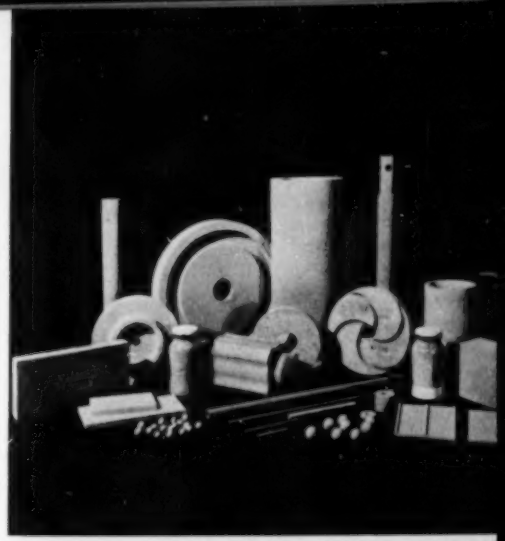


2. NORTON ALUNDUM POROUS MEDIUMS are made in a wide range of sizes and shapes in plates, tubes, discs, and diaphragms for filtration, diffusion, aeration, and electro-chemical applications. Uniformly porous because of patented controlled structure, ALUNDUM porous mediums for all practical purposes are unaffected by the acid, or alkaline conditions normally encountered in commercial applications. Their great strength and extreme resistance to abrasion combine to give them extra long life. Their ability to resist properly applied temperatures up to 1850° F. enables you to burn off organic matter if it clogs the pores.

3. NORTON REFRACTORY SHAPES FOR REACTION FURNACES include bricks, plates, tubes, and blocks in a wide variety of designs. CRYSTOLON, ALUNDUM, MAGNORITE, and FUSED STABILIZED ZIRCONIA refractories are used, depending on the temperature, chemical, electrical, and physical variables.

More and more firms are becoming interested in Norton FUSED STABILIZED ZIRCONIA for obvious reasons. No other refractory is so chemically stable at such elevated temperatures. For example, the chemical industry has operated gas synthesis processes in Norton FUSED STABILIZED ZIRCONIA lined furnaces for long periods of time at temperatures approaching 4700° F. in a neutral to slightly reducing atmosphere.

In addition to its exceptionally high melting point and great chemical stability, Norton FUSED STABILIZED ZIRCONIA has exceptionally low thermal conductivity. This means lower heat loss and resultant lower operating costs even at temperatures up to 4700° F.

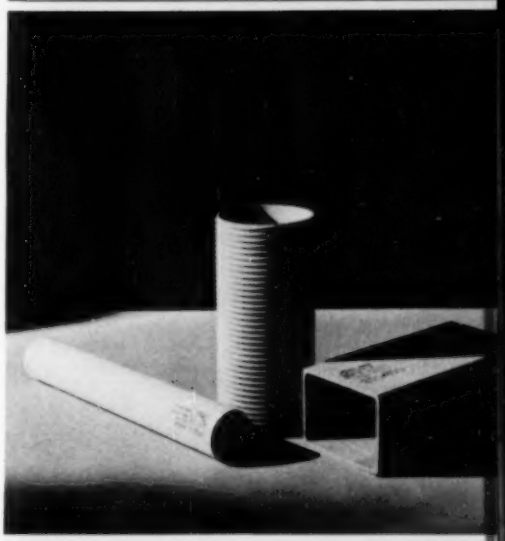


4. NORTON REFRACTORY SHAPES FOR ELECTRIC FURNACES include cores, tubes, and muffles made of ALUNDUM and CRYSTOLON refractories.

Where chemical stability and inertness are required, Norton ALUNDUM shapes are first choice. They do not react either with metallic resistors or with platinum, nickel or fused oxide laboratory ware.

Where high thermal conductivity and resistance to heat shock are necessary, Norton CRYSTOLON shapes offer advantages over ALUNDUM shapes. They are limited however to resistors of nickel chromium alloys and to temperatures not exceeding 2100° F.

Tests with resistors made of Norton FUSED STABILIZED ZIRCONIA in both ultra high frequency induction furnaces and in resistance furnaces indicate possibilities well worth your investigation.

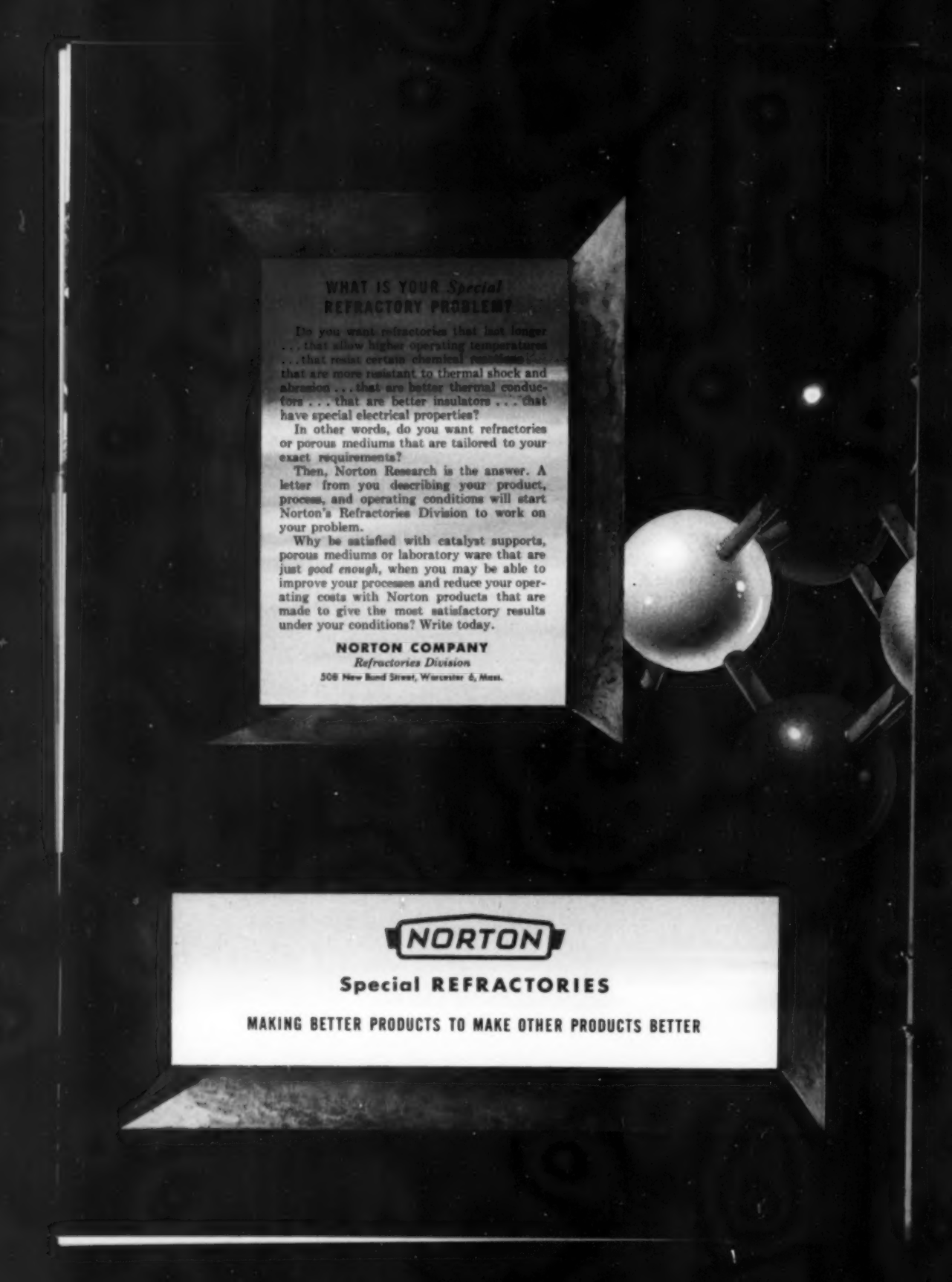


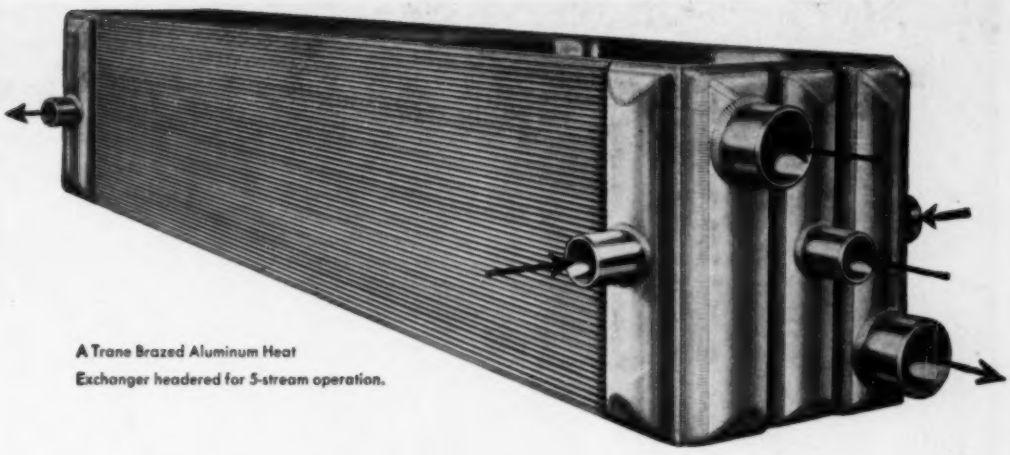
5. NORTON ALUNDUM LABORATORY WARE, containing at least 85% alumina (up to 99% in special mixtures) is not attacked by any organic solvent. Only hydrofluoric acid, concentrated phosphoric acid or concentrated alkalies can affect it. Its maximum usable temperature ranges up to 3450° F.

Norton ALUNDUM laboratory ware is supplied in general purpose crucibles, ignition capsules, incinerating dishes, melting crucibles, filter crucibles, cones, dishes, and discs, extraction thimbles, and combustion boats . . . in many sizes and shapes. Contact your laboratory supply house for complete data and prices.

WHATEVER YOUR REFRACTORY APPLICATION, Norton Research assures you the most practical application of special refractories to your individual requirements.




WHAT IS YOUR *Special* REFRACTORY PROBLEM?
Do you want refractories that last longer . . . that allow higher operating temperatures . . . that resist certain chemical reactions . . . that are more resistant to thermal shock and abrasion . . . that are better thermal conductors . . . that are better insulators . . . that have special electrical properties?
In other words, do you want refractories or porous mediums that are tailored to your exact requirements?
Then, Norton Research is the answer. A letter from you describing your product, process, and operating conditions will start Norton's Refractories Division to work on your problem.
Why be satisfied with catalyst supports, porous mediums or laboratory ware that are just *good enough*, when you may be able to improve your processes and reduce your operating costs with Norton products that are made to give the most satisfactory results under your conditions? Write today.
NORTON COMPANY
Refractories Division
508 New Bond Street, Worcester 6, Mass.
NORTON
Special REFRACTORIES
MAKING BETTER PRODUCTS TO MAKE OTHER PRODUCTS BETTER



A Trane Brazed Aluminum Heat Exchanger headered for 5-stream operation.

This Single Brazed Aluminum Heat Exchanger

Handles FIVE Fluids Simultaneously

Trane Brazed Aluminum Heat Exchangers can be designed to handle up to five streams, or even more, at the same time – and meet the heat transfer needs of each stream accurately and efficiently.

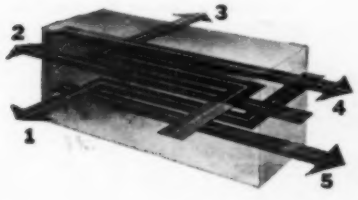
A single unit can be made to handle two, three, four, five or even more different liquids or gases. Headers are designed specifically for your installation. You can take any stream off at any point in the exchanger. You can split a stream, taking part off at one point in the unit at a given temperature and pressure, the rest off at another point at different conditions. The units provide just the heat transfer, pressure drop, volume, velocity, number and direction of passes needed for each stream.

And the units can meet these heat transfer specifications in the most limited space. That's because the Trane Brazed Aluminum Heat Exchangers pack up to 450 square feet of heat transfer surface into one cubic foot – nine times more than a tubular exchanger with ¾" tube.

Since a smaller unit can do a bigger job, *Brazed Aluminum Heat Exchangers can often replace tubular exchangers costing two or three times more and weighing four times more.*

These all-aluminum Trane Heat Exchangers are rugged, too. They take test pressures up to 1,000 lbs. per square inch, and temperatures from –300° to 500°F.

Whether the job calls for high or low temperatures or pressures, for one stream or many – as long as efficiency and economy are important – Trane Brazed Aluminum Heat Exchangers can be the answer. Contact your nearest Trane sales office or write direct.

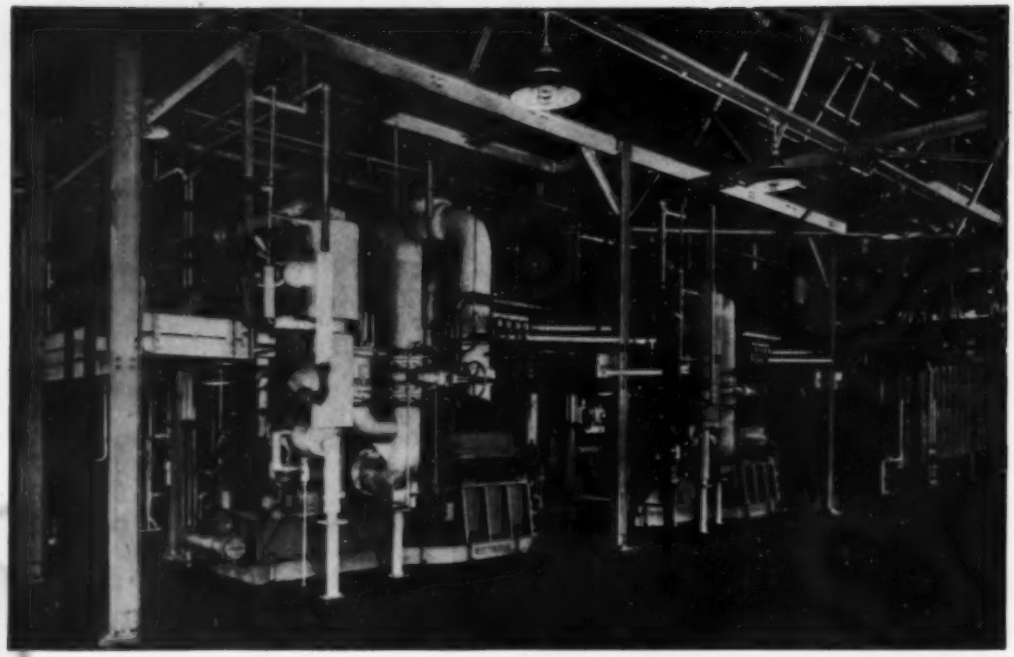


Symbolic drawing, left, shows one of many ways in which a Trane Brazed Aluminum Heat Exchanger may handle up to five fluids simultaneously.

TRANE

THE TRANE COMPANY, LA CROSSE, WISCONSIN
Eastern Mfg. Division . . . Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . . Toronto
OFFICES IN 80 U. S. AND 14 CANADIAN CITIES

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT



Two Worthington centrifugal compressors, each capable of handling the full 380-ton load; at right, one of the three Worthington chilling machines.

How Socony-Vacuum Gives Wax the Cold Shoulder

For the new addition to its Paulsboro refinery, Socony-Vacuum and its process engineers and constructors, E. B. Badger & Sons Co., found the *right* chilling equipment in Worthington's complete line.

Here's how this modern plant meets the 380-ton refrigeration load required by its solvent dewaxing process.

Plant propane is alternately condensed and vaporized in a closed cycle. The liquid propane, boiling at a low pressure and a constant temperature of minus 25F, surrounds the tubes in the Worthington inclined chiller through which the wax-bearing mixture is pumped.

Propane vapor, released in the chiller, is withdrawn to be compressed, with two liquid intercooling stages, from suction conditions of about 8 psig to a condenser pressure of 215 psig.

The compressors are four-stage Worthington centrifugal compressors. They are driven by 8420 rpm Worthington steam turbines which take steam from the plant mains at about 400 psig and exhaust at 40 psig back pressure to be used for heating purposes in other parts of the solvent recovery process.

Important installations such as this one are most likely to include Worthington refrigeration, because Worthington offers complete cycles for petroleum, chemical and petro-chemical applications, including centrifugal charge gas compressors for high pressure, condensers, coolers and exchangers.

Take advantage of the *more worth in Worthington*. Write for bulletin to Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey.

A-1-43

WORTHINGTON

THE ONLY COMPLETE LINE...ALWAYS THE CORRECT RECOMMENDATION

Which one of 23 high temperature tube steels do you need? Ask the experts!

AMONG the 23 high temperature tube steels produced by Timken®, there is *one* and only *one* which can solve your heat, pressure, corrosion, and oxidation problems and give you the *best* life/cost ratio, too. And metallurgists of the Timken Company can help you pick it.

These metallurgists are recognized authorities in high temperature steels—have 21 years of experience and research behind them. With 23 analyses to choose from they can recommend the one best tube for your job. And whichever tube you use, you can be sure of uniform quality; Timken closely controls quality from melt shop through final inspection.

Let Timken's "RSQ"—Research, Supply, Quality—solve your high temperature tube problems. Ask the experts! The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

This month Timken reports on:

SICROMO 2½

Suitable for applications in which corrosion resistance is a major consideration, but where conditions do not warrant use of higher-price 4-6 Cr.-Mo. steel. Stability, strength, and oxidation resistance compare favorably with 4-6 Cr.-Mo. Recommended for cracking furnace tubes, heat exchangers, superheater tubes, vapor and hot oil lines.

ONE OF 23 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	16-13-3*
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20*
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-12*
Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

**Available as seamless tubing on an experimental basis only.*



Photo shows metallurgist at Timken determining the lattice structural characteristics of an alloy with X-ray diffraction equipment. Research like this is a big reason for Timken's leadership in high temperature steels.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing



FOR LIQUID COOLING... Here's Why

"Buffalo" EVAPORATIVE COOLERS *do your job Better*

1. QUALITY IN ALL PARTS — Evaporative Coolers have Aerofin spiral fin coils, which are tops for long life and efficiency in liquid cooling. "Buffalo" aluminum wheel, hollow-shaft "mixed flow" fans, unexcelled for quiet delivery, supply the air for evaporation. Quality "Buffalo" pumps recirculate the spray water. In fact, quality construction through and through assures you a permanent unit that will save you many a "headache" later on.

2. SIMPLIFIED 3-SECTIONAL DESIGN means easy installation (sections pass through ordinary building openings) and simplified maintenance. Sections are in standardized units — blower head, coil and tank sections.

3. OTHER ADVANTAGES — include compact size, easy operation, water economy, indoor or outdoor installation. WRITE FOR BULLETIN 3666. Look over the specifications, and you'll agree that these high-quality coolers pay for themselves in performance.



"Buffalo" FIRST FOR FANS

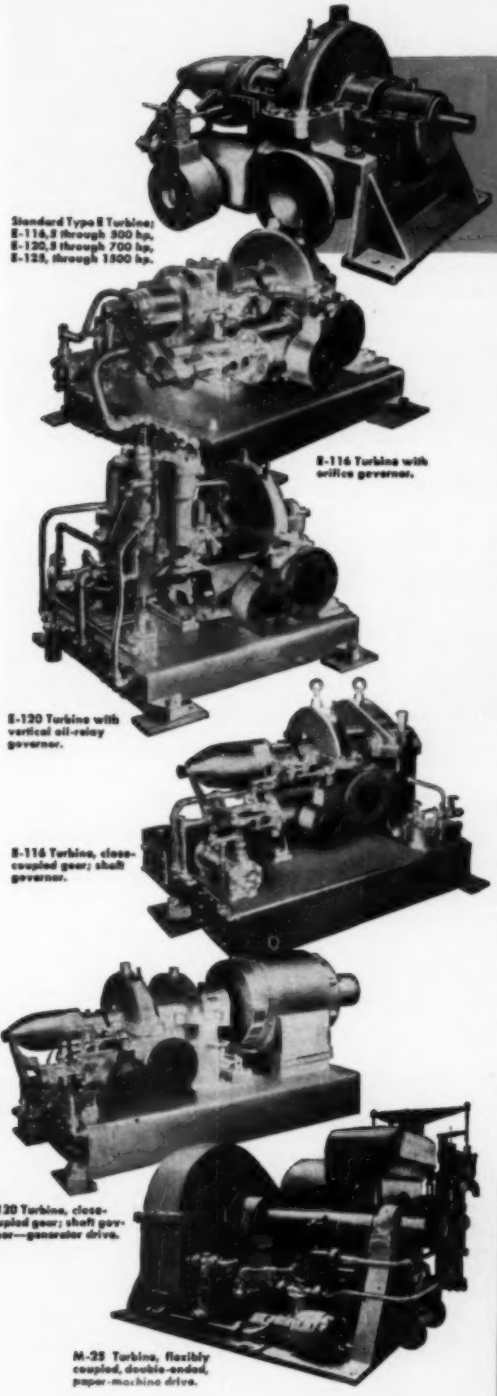
BUFFALO FORGE COMPANY

501 BROADWAY BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING

Take the *Guesswork* out of Turbine Selection!



Standard Type E Turbine; E-116, 5 through 300 hp, E-120, 5 through 700 hp, E-128, through 1500 hp.

E-116 Turbine with orifice governor.

E-120 Turbine with vertical oil-relay governor.

E-116 Turbine, close-coupled gear; shaft governor.

E-120 Turbine, close-coupled gear; shaft governor—generator drive.

M-25 Turbine, flexibly coupled, double-ended, paper-machine drive.

Westinghouse General-Purpose Turbines can be supplied for mechanical or generator drive . . . either direct connected or geared . . . for condensing or noncondensing operation. This *complete* line . . . plus a nationwide staff of trained steam engineers, conveniently located sales offices, and service shops . . . assures you of the correct solution to *your* steam-drive application problem.

The single-stage Type E turbine, with designs for three basic classes of steam conditions, three wheel sizes and three standard governor types, provides in effect twenty-seven *standard, economical* variations to cover a wide range of applications. In addition, an almost limitless number of special applications can be met through the use of heavy-duty parts, and optional accessories.

Geared-turbine drives are offered either flexibly coupled to accommodate either right- or left-hand gear offsets, double-ended output shafts; or close-coupled (Gearturbines). Gearturbines are standardized on a single offset arrangement, affording utmost economy.

Other types in the complete Westinghouse general-purpose turbine line include heavy-duty and multi-stage units for applications requiring high temperatures and pressures, higher speeds, greater horsepower, extraction for process applications, or higher efficiency than may be had with single-stage machines.

The superiority of the Westinghouse line is the result of over 60-years' design, manufacture, and application experience. To get the benefit of this broad know-how, call your nearby Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-50532

YOU CAN BE SURE... IF IT'S

Westinghouse

GENERAL-PURPOSE TURBINES

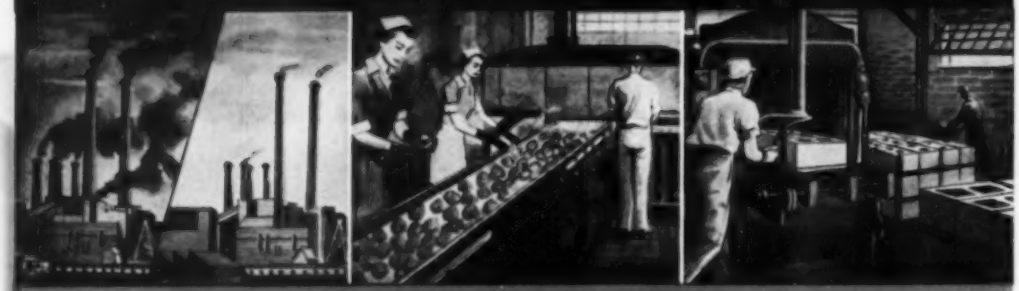
ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

D-40

is more than a detergent

The detergent base of many industrial and household cleaning compounds, Oronite D-40 has dozens of other uses. Its versatility and high quality are characteristic of the chemicals made by Oronite—a dependable source of basic ingredients for better products.



THREE TYPICAL INDUSTRIAL USES OF ORONITE D-40:

1 SMOG REDUCTION

Use of D-40 in smog control systems, removes hydrocarbons from stack gasses and prevents the formation of undesirable emulsions in the "scrubbing" solution. In actual practice this process has reduced exhaust smoke by as much as 90%, which offers a potential control of smog conditions in industrial areas.

2 AGRICULTURE

In addition to its value in washing many fruits and vegetables, Oronite D-40 is a tremendous aid in peeling these foods during canning and packing operations. Two distinct advantages are obtained; 1) immersion time and the concentration of alkali can be reduced and 2) the fruits and vegetables retain better color.

3 CEMENT

The use of Oronite D-40 in the production of cement products, such as building blocks, provides many distinct advantages. The texture of the finished product is improved, water requirements reduced, plasticity and workability are better and "stripping" from molds or forms is facilitated. In addition, the abrasive wear on mixing equipment is greatly reduced. All these contributions help cut production costs.

A partial list of other Oronite Chemicals

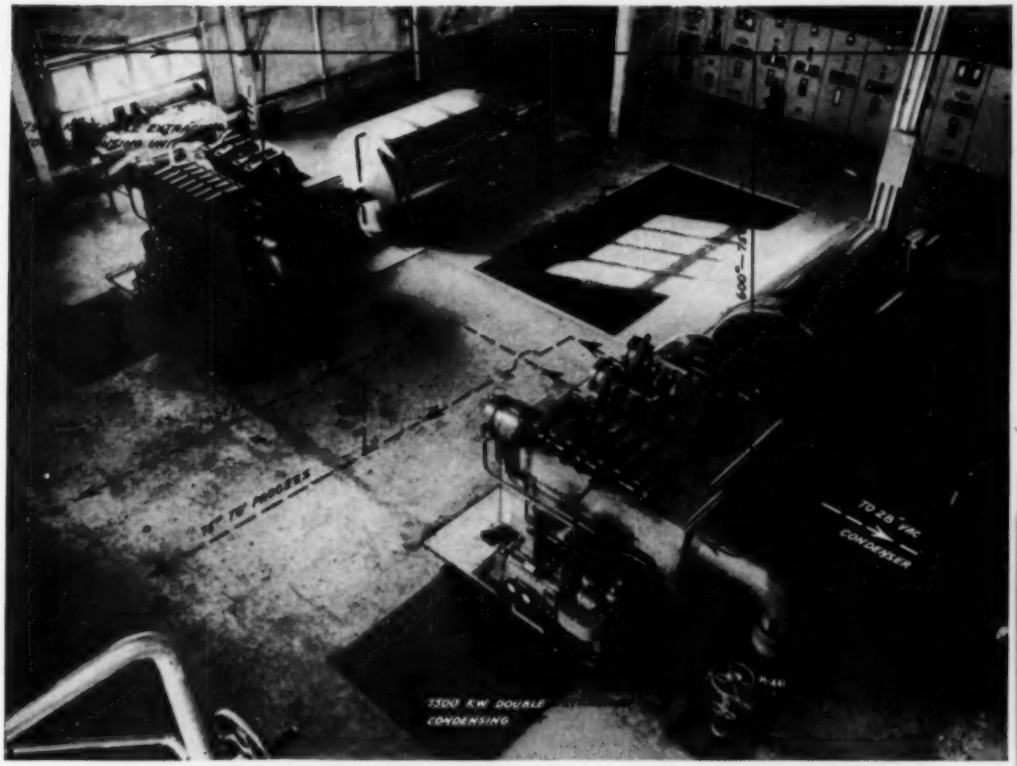
NOTICE
Some of the following are currently in short supply.

Detergent Alkane	Gas Odorants	Ortho Xylene
Detergent Slurry	Polybutenes	Para Xylene
Detergent D-60	Sodium Sulfonates	Xylol
Wetting Agents	Purified Sulfonate	Aliphatic Acid
Lubricating Oil Additives	Naphthenic Acids	Hydroformer Catalyst
Cresylic Acids	Phthalic Anhydride	

If you want more detailed information about D-40 or other Oronite Surface Active Agents, just write us and we'll be glad to send it to you.

ORONITE CHEMICAL COMPANY

38 SANSOME ST., SAN FRANCISCO 4, CALIF. — STANDARD OIL BLDG., LOS ANGELES 15, CALIF.
30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y. — 600 S. MICHIGAN AVENUE, CHICAGO 5, ILL.
MERCANTILE SECURITIES BLDG., DALLAS, TEXAS



Process Steam Maintained at 2 Pressures

by Worthington Turbine Generators

This is how Worthington and a Far West cellulose mill set up the steam supply for utmost efficiency and flexibility.

We combined a non-condensing single automatic extraction unit with a condensing double automatic extraction unit. The 7500-kw units operate in parallel and, in addition to supplying plant power, furnish steam at two pressures for process requirements.

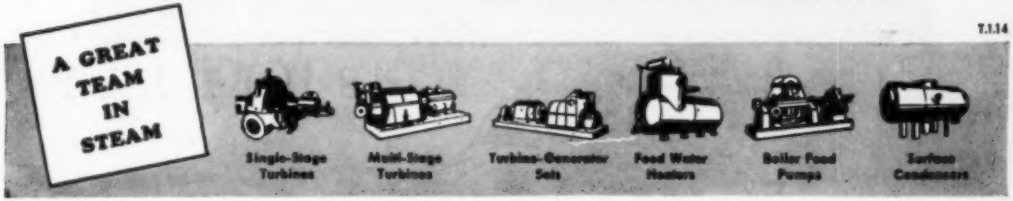
Along with the advantages of efficient operation and low cost and ability to adjust to mill requirements, this mill benefits from the manufacturer's *unit responsibility*. In this case, Worthington also furnished two 470-hp turbines to drive boiler feed pumps, two 452-hp turbines to drive induced-draft fans, two 146-hp turbines to drive forced-draft fans, and one 50-kw turbine-driven exciter set.

If you want proof *there's more worth in Worthington*, write Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, New York.

WORTHINGTON

STEAM TURBINE GENERATORS

T.1.14



For



PHILLIPS

distinguished service...

PHILLIPS PETROLEUM COMPANY is proud to receive the 1951 Chemical Engineering Achievement Award for having:—

"... contributed most to the advance of chemical engineering in industry..."

Seventy of the nation's leading chemical engineering authorities independently voted this honor to Phillips for a two-fold achievement: First, Phillips development of high abrasion carbon black; second, Phillips major contribution to the success of cold synthetic rubber. Together these advances make possible automobile tires that wear thousands of miles longer than the finest tires ever made before.

Credit for this success goes to those who make chemical dreams come true in our laboratories and plants. Over 2,000 of our nearly 20,000 employees are scientists and engineers. From their diversified efforts come achievements without number across the whole broad field of petroleum chemistry.

We work vigorously with nitrogen fertilizers, atomic energy, sulfur compounds, synthetic fiber materials and many organic chemicals. And, of course, we are in our third decade as large producers, refiners and marketers of fuels and lubricants.

Previously this award has recognized such great endeavors as the Atomic Bomb Project and the wartime Synthetic Rubber Industry.

It is a privilege for us to be honored with these groups and with the other important chemical companies which have also earned this high distinction for chemical engineering accomplishments.



WHAT THIS ACHIEVEMENT MEANS TO YOU

For every 9,000 miles you drive your car, the average wear is about ⅛th of an inch from the tread of natural rubber–tires made with ordinary carbon black.

Now, with tires made with *Philblack O* high abrasion carbon black* and *cold rubber,* the same ⅛th inch of tread wear will give you 12,000 . . . 13,000 . . . even 14,000 miles of good, safe service.

*A Trademark

Phillips 66

PETROLEUM COMPANY

Phillips Chemical Company, a subsidiary

Bartlesville, Oklahoma

A Bedtime Story for Very Junior Chemists



Once upon a time, there lived a sad little Sodium CarboxyMethylCellulose. He worked very hard extending Soaps and improving Synthetics. But all the Soaps called him a "war baby." And he wasn't allowed to associate with any but Low Grade Synthetic Detergents.



So he ran away. And arrived one day on the Doorstep of a Corporation in Wyandotte, Michigan. The Corporation picked him up and handed him over to the Research and Development Division. Well, you should see what they did for this little "war baby"!



They changed his length and Molecular Structure. They Manufactured him by a brand new Process. They let him associate with High Grade Synthetic Detergents. And then they gave him a name . . . "Carbose*."

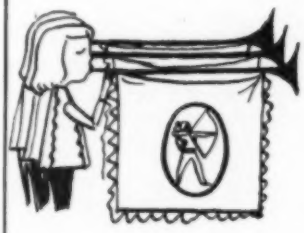
*Reg. U. S. Pat. Off.



Carbose might have been very happy—but the Soaps still put on airs. "No matter how hard you and those Synthetics try," the Soaps told him, "nothing cleans as well as Soap."



But he worked hard just the same. He practiced Soil Removing and Whiteness Retaining and all the other things a detergency promoter should. And one great day, the Research and Development Division called the Soaps and Synthetics together and read a Proclamation:



"Synthetic Detergent products can be formulated with Carbose which will yield detergency equal to that of High Grade Soaps under conditions favorable to Soap, and far superior to High Grade Soaps under conditions unfavorable to Soap."



"Carbose!" Why, they were talking about him! Carbose was a hero! Yes, it was a great triumph for him . . . but Carbose went on . . . had a large family and did many more things . . . in textiles, paper, paints, ceramics, petroleum . . . and even in soap!

Soda Ash • Caustic Soda • Bicarbonate of Soda • Calcium Carbonate • Calcium Chloride • Chlorine • Hydrogen • Dry Ice Synthetic Detergents • Glycols • Carbose (Sodium CMC) • Ethylene Dichloride Propylene Dichloride • Aromatic Sulfonic Acid Derivatives • Other Organic and Inorganic Chemicals

WYANDOTTE CHEMICALS CORPORATION
Wyandotte, Michigan — Offices in Principal Cities

Wyandotte
REG. U. S. PAT. OFF.

So if you are looking for a chemical with applications involving viscosity regulation, colloid stabilization, surface finishing, or detergency, why not write to us about Carbose?



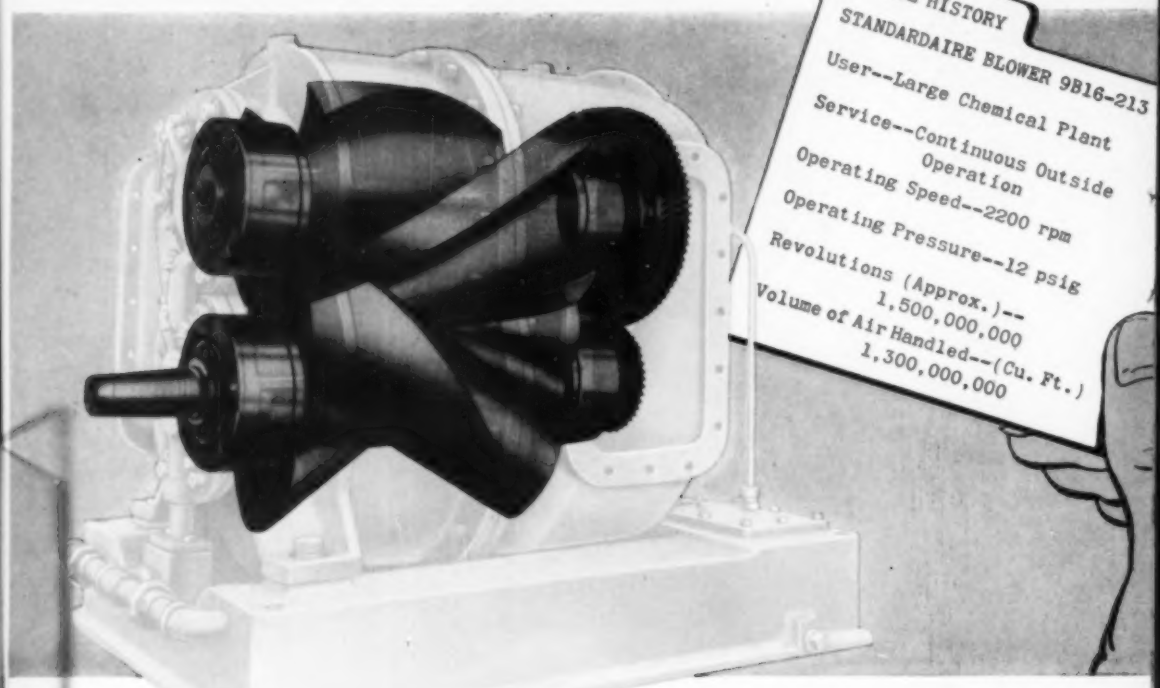
The STANDARDAIRE BLOWER

After HANDLING

1 1/3 BILLION cu. ft.

OF HIGH PRESSURE AIR

Standardaire #9B16 • • • YEARS

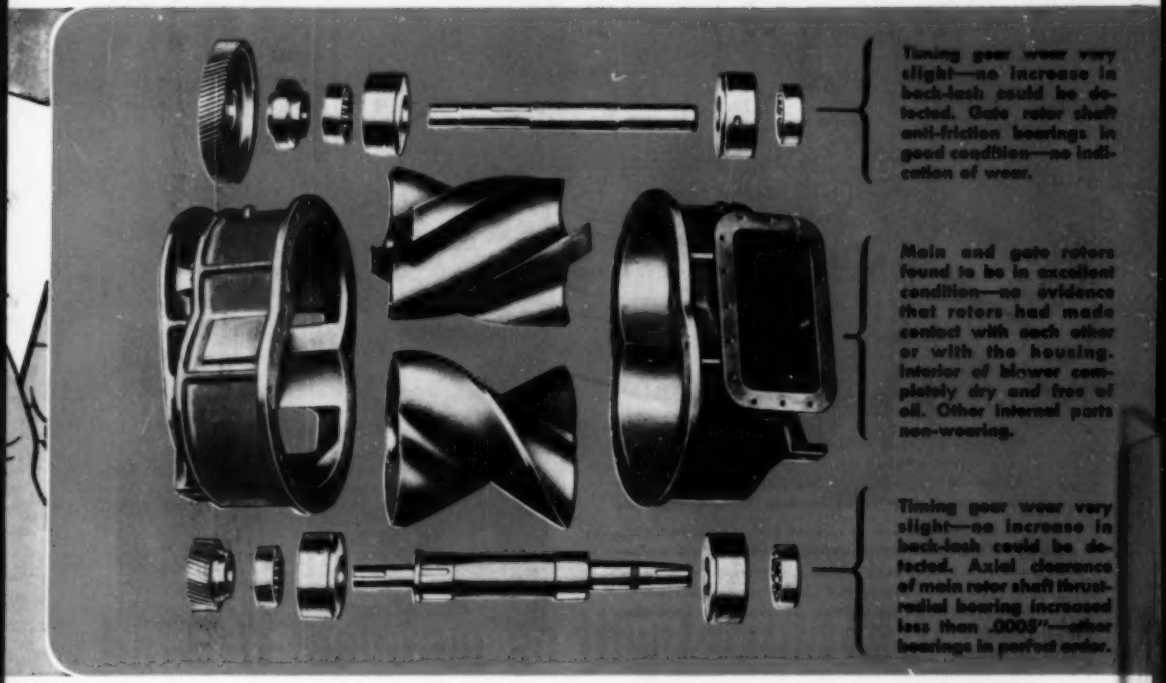


• For HIGH OUTPUT *Standardaire Blowers*

STANDARDAIRE—IT'S BUILT TO "TAKE IT"— Rarely does a manufacturer have an opportunity to measure the efficiency and quality of his product after a period of continuous trouble-free service. In a recent instance, however, Read Standard had such an opportunity and now releases the performance data on Standardaire Blower 9B16-213. This blower operated in a large Chemical Plant for a period of fifteen (15) months—24 hours a day—at a speed of 2200 rpm—pressure 12 psig—air delivery 1950 cfm. During fifteen (15) months of operation it is calculated that the Standardaire Blower handled 1⅓ BILLION cubic feet of high pressure air and made approximately 1½ BILLION revolutions—equivalent to over 20 years service for the average lobe type blower (40 hours per week at 500 rpm). The need for a still greater volume of air in their system prompted the chemical company to install a larger Standardaire Blower. The used blower was then sealed and returned to the factory for inspection.

STANDARDAIRE—INSPECTION AFTER 15 MONTHS SERVICE: Even after the hard and difficult service this blower performed it was found to be in excellent condition when dismantled and inspected in the presence of the chemical company's representative. No oil leaks had developed and the internal parts were completely dry and free of oil. Pump circulated oil was used for lubrication. The main and gate rotors were in perfect shape and showed no indication of wear. Neither was there any evidence that the rotors had made contact with each other or with the housing. Combination thrust radial bearing on the main rotor shaft carried the heaviest load due to thrust created by the main rotor. The actual clearance in this bearing was checked with a dial

of performance in 15 months Service



LONG LIFE----
have STAYING POWER

indicator and it was found that it had increased less than .0005". The other anti-friction bearings were found to be in perfect condition. Gear wear was so small that no increase in backlash could be detected. Even at the extremely high peripheral speed of these gears they were found to be very quiet in service.

STANDARDAIRE—FOR THAT EXTRA LIFE: This factual information is presented to acquaint the users of blower equipment with the extra life built into all Standardaire Blowers. Read Standard offers industry a wide range of axial flow, positive displacement blowers. They are modern in design—superior in performance—dependable in operation. For staying power and maximum efficiency it's the Standardaire Blower. For further information write Dept. E-30.

READ STANDARD CORPORATION
370 Lexington Ave., New York 17, N.Y.

Be sure to visit our exhibit Booth 230
23rd EXPOSITION
CHEMICAL INDUSTRIES
GRAND CENTRAL PALACE
NOV. 25 TO DEC. 1
See the Standardaire Blower
in operation

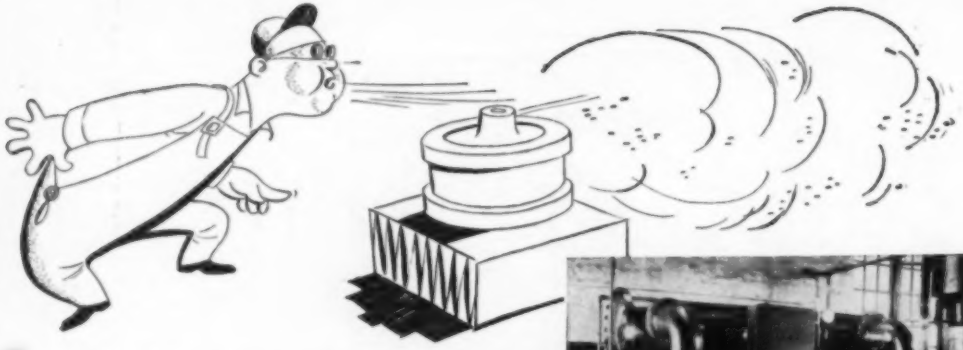
AXIAL FLOW
STANDARDAIRE BLOWER

BLOWER-STOKER DIVISION

READ STANDARD
CORPORATION

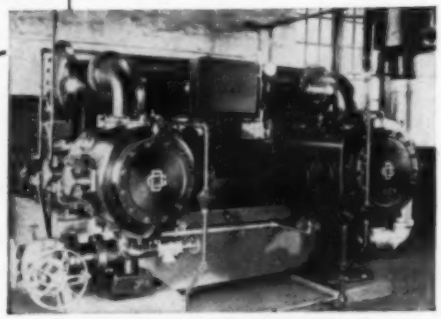
NEW YORK · CHICAGO · ERIE · YORK · LOS ANGELES

You don't have to skimp on compressed air!

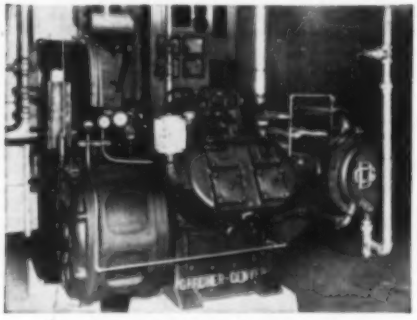


An ample supply of compressed air arms you with many opportunities to speed production—conserve man-hours—hold costs in line. Especially when it's the lower-cost-per-cubic-foot air from a Gardner-Denver Compressor.

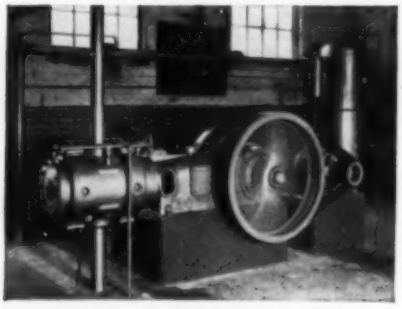
Backed by more than 90 years of quality manufacturing, Gardner-Denver Compressors handle constant peak loads—dependably . . . keep maintenance and operating costs so low you can use compressed air throughout your plant—without skimping. Write us today for complete information.



HA Two-Stage, Horizontal Compressor 593 to 1854 cu. ft. displacement per min.



WB Two-Stage, Vertical Compressor 142 to 686 cu. ft. displacement per min.



RX Single-Stage, Horizontal Compressor 89 to 1292 cu. ft. displacement per min.



AA Single-Stage, Vertical Compressor 32 to 183.6 cu. ft. displacement per min.

SINCE 1859

GARDNER-DENVER

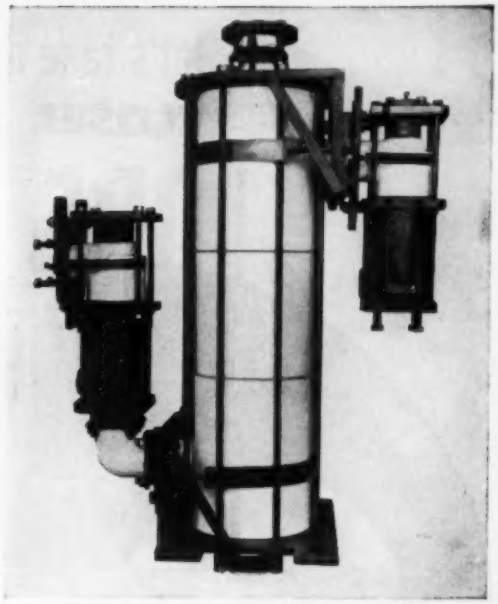
Gardner-Denver Company, Quincy, Illinois, U. S. A.

In Canada:
Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS



Worthington two-stage non-condensing ejector—porcelain



Worthington two-stage condensing unit—porcelain

How To Maintain an Uninterrupted Vacuum

in the presence of corrosive vapors

Use a Worthington corrosion-proof steam-jet ejector. These are made in stock sizes and specially engineered for handling any corrosive vapor problem in the chemical field.

For corrosive vapors, these ejectors are made with impervious graphite nozzles and diffusers. Suction chambers are of porcelain, but these can also be furnished of impervious graphite. Porcelain diffusers are also available.

For corrosion-*resistant* usage, Worthington makes ejectors of bronze, stainless steel or Worthite (a special Worthington "super-stainless").

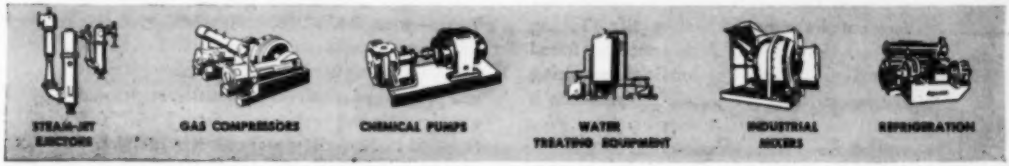
Worthington's is the *most complete* ejector line. A model for every vacuum requirement—from atmospheric to 50 microns absolute. Single and multiple stages. Condensing and non-condensing.

Put your problem—distillation, drying or any other vacuum problem—up to Worthington Pump and Machinery Corporation, Steam Power Division, Ejector Section, Harrison, New Jersey.

WORTHINGTON

STEAM POWER DIVISION

X.1.2



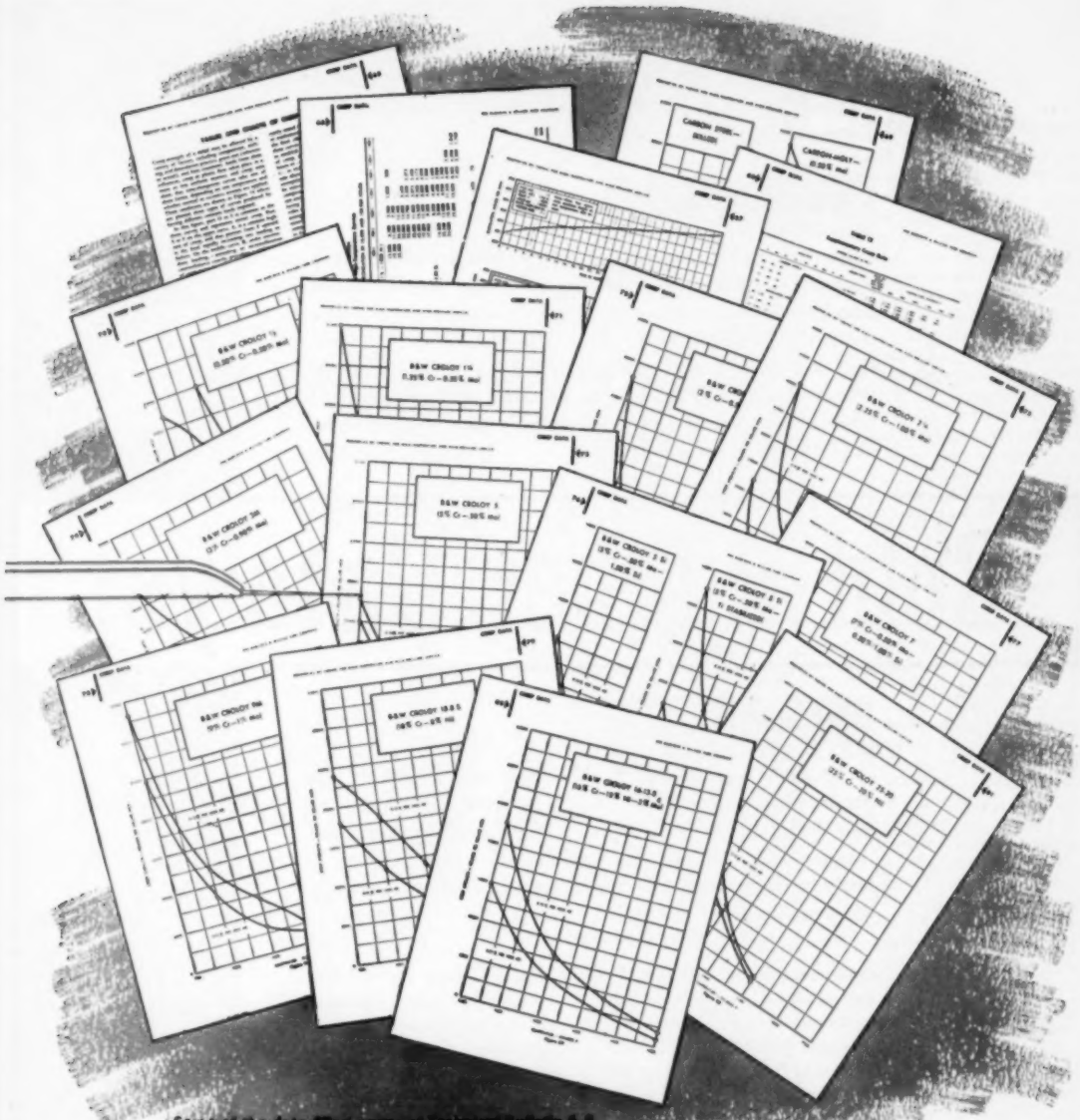
let's take a CLOSER LOOK at CREEP STRENGTH



Steel Tubing subjected to long periods of high-temperature and stress conditions in chemical and petro-chemical equipment undergoes slow deformation, or plastic flow, known as "creep". To keep this elongation within safe limits so as to prevent costly tube failures and consequent production tie-ups, tubing for such applications must possess adequate resistance to deformation throughout its expected service life. Tubing made from molybdenum-bearing steels has found distinct favor for operating conditions requiring high creep strength . . . because molybdenum is generally the most effective alloying element for increasing creep strength at a given cost.

As molybdenum provides resistance to creep at elevated temperatures, and chromium provides resistance to oxidation and corrosion—a complete series of chromium-molybdenum alloy steels has been developed. Each of these steels is designed to give optimum service under certain operating conditions.

Whenever creep is your problem, consult Mr. Tubes—your B&W Tube Representative. He offers you a wealth of experience and technical data in selecting tubing with optimum chemical and physical properties for operation at elevated temperatures and pressures . . . from B&W's full range of carbon, alloy, and stainless analyses.



Some of the data sheets on Technical Bulletin 6-B, covering creep strength and other performance characteristics of B&W Tubing for service at high temperature and pressure. Write for a free copy. The Babcock & Wilcox Tube Company, Beaver Falls, Pa.

THE BABCOCK & WILCOX TUBE COMPANY

***Executive Offices:* Beaver Falls, Pa.**

General Offices & Plants

Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing

Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. • Cleveland 14, Ohio • Denver 1, Colo. Detroit 26, Mich. • Houston 2, Texas • Los Angeles 17, Calif. • New York 16, N. Y. • Philadelphia 2, Pa. • St. Louis 1, Mo. • San Francisco 3, Calif. • Syracuse 2, N. Y. • Toronto, Ontario • Tulsa 3, Okla.

B&W SEAMLESS and WELDED TUBES

TA-16035

PROBLEM...

. . . to help the rubber industry perfect low temperature polymers and accelerate their commercial production for automobiles and truck tires.

SOLUTION...

. . . a new synthetic rubber catalyst, Para-Menthane Hydroperoxide—which shows exceptionally high polymerization activity and has been found particularly satisfactory for production of synthetic cold rubbers of the GR-S-100 type. Hercules* Para-Menthane Hydroperoxide (PMHP) also shows promise as a catalyst for the emulsion polymerization of other monomers such as acrylonitrile, methyl methacrylate, vinyl acetate, and vinyl chloride.

Cold Rubber Catalyst

RESULT...

. . . tougher, longer-wearing rubber that can be economically produced in quantity from readily available materials. Not only tires, but many other civilian and defense products are prospects for cold rubber. This successful synthetic owes its rapid growth largely to the catalysts which were ready when needed.

Other commercial grade hydroperoxides produced by Hercules and used as polymerization catalysts include Hercules* Cumene Hydroperoxide (CHP) and Hercules* Diisopropylbenzene Hydroperoxide (DIBHP). Many other Hercules chemical materials have helped in the development of synthetic rubbers and in improvements of natural rubber products, too. These include emulsifiers, reclaiming agents, numerous rosins and synthetic resins, casein, and purified cotton linters as a base for tougher tire cords. Hercules welcomes the opportunity of placing its long experience in rubber and associated chemical materials at your disposal.

HERCULES POWDER COMPANY 952 Market St., Wilmington, Delaware

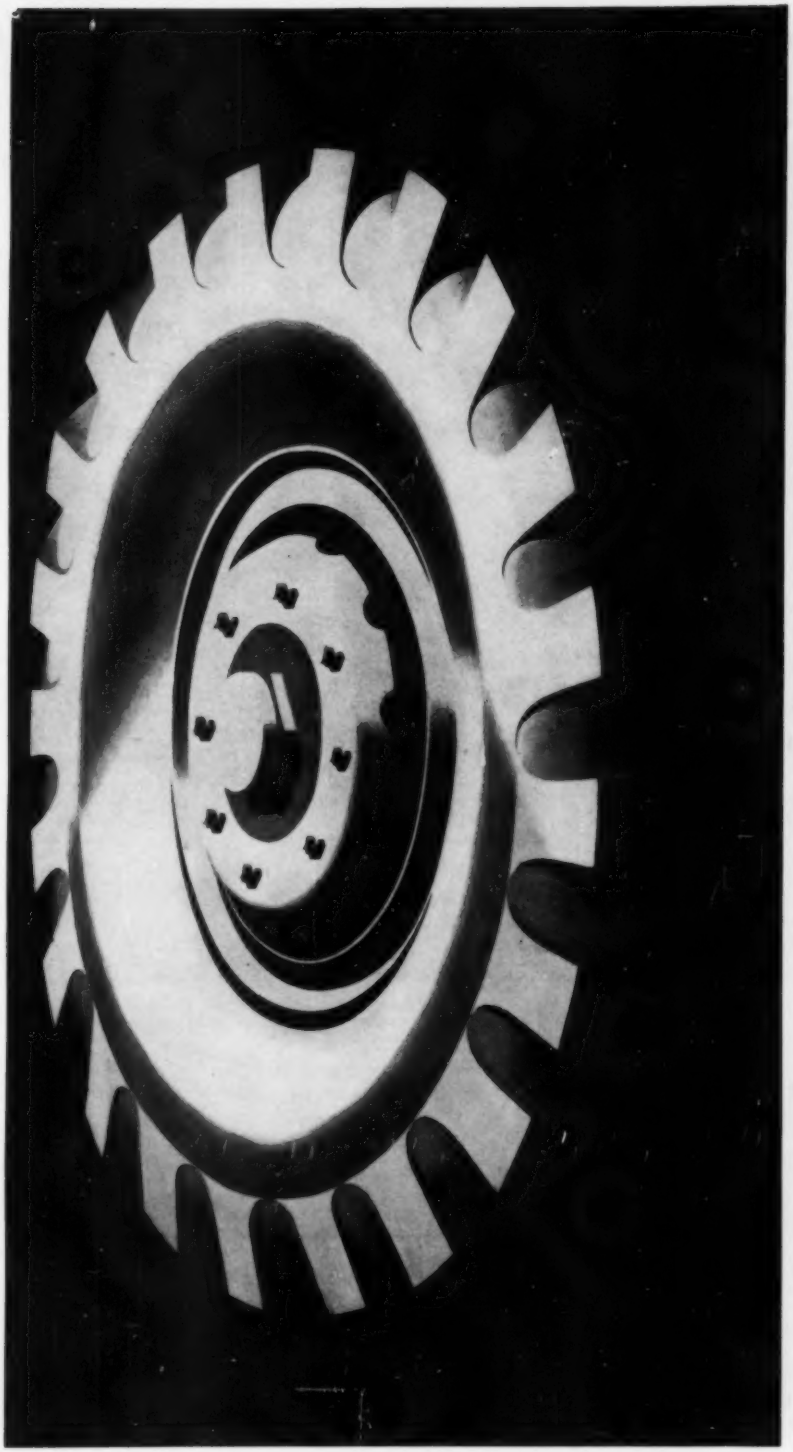
Sales Offices in Principal Cities

*Trademark



HERCULES

SYNTHETIC RESINS—CELLULOSE PRODUCTS—TERPENE CHEMICALS—ROSIN AND ROSIN DERIVATIVES—CHLORINATED PRODUCTS—OTHER CHEMICAL MATERIALS FOR INDUSTRY





CMC Improves Paperboard

Hercules® CMC, purified cellulose gum, is being used effectively and efficiently by the paperboard industry for calender stack water box treatment. CMC produces resistance to penetration by oils, greases, and waxes; improves surface strength and prevents scuff resistance and fuzz difficulties; and improves mullen and tensile strength. Board treated at the calender stack with CMC may be given a densometer reading 20 times and a decrease in oil penetration rate of 10 times that obtained with water only. For waxing grades such a treatment may reduce wax consumption by 30 to 35% and give a superior print job. Very worthwhile ink savings and improved press operations are possible with CMC-treated board.

New Uses for HEC

The newest use found for Natrosol® Hercules hydroxyethyl cellulose is to aid the coagulation of agents used in water purification; HEC promotes fast settling of alum flocs, and improves clarity of the water. HEC is also suitable as a starch replacement in flotation, a permanent size in textiles. Other possible applications include textile printing media, inks, leather coatings. Two viscosity types are available. Natrosol, Hercules hydroxyethyl cellulose is an alkali-soluble, water-insoluble cellulose ether of good film-forming properties. Density 1.49 gm/cc and refractive index 1.534, in film form, at 25°C. Natrosol, Hercules hydroxyethyl cellulose is a white, tasteless, odorless, fibrous solid, insoluble in all common organic solvents, oils, fats, and greases, soluble in alkalies—e.g. 2% to 18% NaOH.

For Next Summer's Flies

Thanite® will take care of them! Developed by Hercules, this terpene thiocyanoacetate makes insecticide sprays that have a fast effective kill, cost little to produce. Only three gallons of Thanite in 97 gallons of base oil produce a spray that grades AA by the official Peet-Grady method; even 1% Thanite gives knock-down punch to a 5% DDT residual spray.

Visit the Hercules exhibit, 7W, at the *TWENTY-THIRD EXPOSITION OF CHEMICAL INDUSTRIES*, Grand Central Palace, New York 17, N. Y., November 26 to December 1, 1951.

GC51-6

How chemical plants



DOW CHEMICAL'S South Power Plant is completely Link-Belt equipped for coal handling, including 14 conveyors and feeders — apron, belt, flight and reciprocating types. In addition, Dow uses a Link-Belt Roto-Louvre Dryer to dry a wet, low-grade bituminous that permits extremely economical steam generation for both power and processing.

LINK-BELT engineering experience... plus LINK-BELT quality products... add up to lower cost per ton handled

Coal is vital to the operation of most chemical process plants. Sometimes it is the basic raw material. That's why coal handling efficiency is of the utmost importance in this field. And that's why so many leading chemical processors rely on Link-Belt.

For Link-Belt builds a complete quality line of coal handling equipment. Equally important, L-B engineers can draw on a tremendous background in both large central station and smaller industrial coal handling applications. They'll be glad to work with you or your consultants—help you get the system that best meets all your plant's requirements.

Get complete information from the Link-Belt office near you. Or write for catalogs on any equipment shown on these pages.

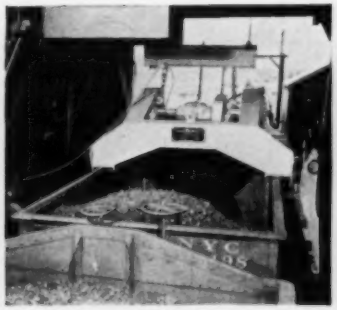
In the Chemical Processing Industries...

These same units—and many more—are used for conveying and processing nearly every bulk material. Whatever the peculiarities of your product—stickiness, abrasiveness, corrosiveness, toxic fumes, explosive dust, matting or packing—get in touch with Link-Belt for the *right* conveying system to meet your needs.

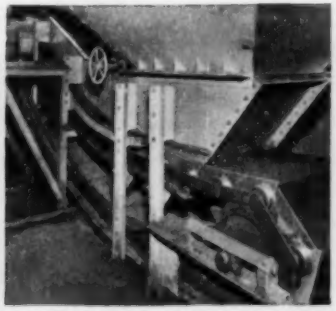
cut coal handling costs



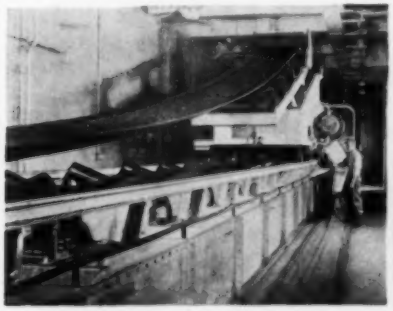
ROTARY DUMPER unloads gondolas in 90 seconds or less (including return to upright position. Handles all types of open top cars up to 90-ton capacity.



L-B CAR SHAKER is easier on cars, thanks to exclusive low-frequency vibration. Noise level is lower. Positive action cleans hopper bottom cars fast.



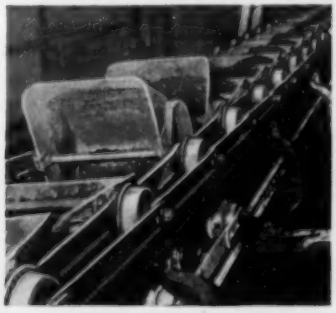
APRON FEEDERS move coal horizontally or on inclines up to 25° from hoppers or bins in a continuous, uniform flow. Rugged, overlapping pans resist impact.



BELT CONVEYORS handle large tonnages at low cost—stocking out, reclaiming, distributing. Link-Belt builds all types of idlers, terminal machinery, trippers.



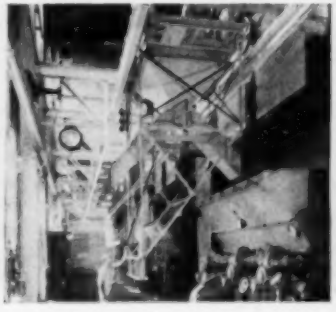
BUCKET ELEVATORS offer flexible, low-cost handling. Photo shows L-B elevator that discharges to silo and also handles coal to and from reserve ground storage.



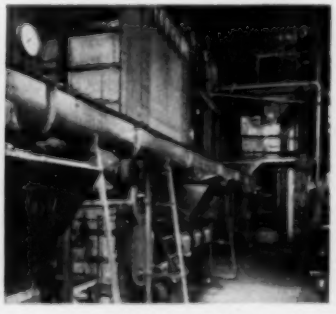
PECK CARRIERS can combine horizontal, vertical and inclined travel in a vertical plane. Smooth, quiet operation with no vibration results in long life.



BULK-FLO combines functions of conveyor, elevator and feeder in a single unit of high capacity. In above application it distributes coal to stoker hoppers.



WEIGH LARRIES automatically weigh and record amount of coal delivered to each stoker or bunker. Link-Belt offers motor- or hand-propelled types in all sizes.



SCREW CONVEYORS provide economical distribution of coal to stoker hoppers. Link-Belt can supply all components—screws, troughs, hangers, drives, etc.

COAL HANDLING EQUIPMENT

LINK-BELT

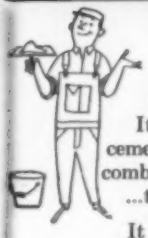
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa).
Offices in Principal cities. 52,088



There's an

Eagle-Picher Insulation

that can help you control temperatures accurately...economically!



Here's just one of the many efficient, economical Eagle-Picher Insulations. It's Eagle-Picher one-coat, all-purpose cement—a revolutionary new product that combines insulating and finishing materials ...that goes on in one easy-to-apply coat.

It gives your equipment highest possible thermal efficiency ... cuts operating costs by saving fuel ... and helps to provide perfect, precise control on temperatures.

Whatever your requirements ... there's an Eagle-Picher Insulation that can fit your needs. Find out about them right away!



THESE EAGLE-PICHER PRODUCTS CAN SAVE YOU MONEY ... POWER ... TIME

Insulating Felts® Supertemp Blocks® Blankets Loose Wool® Pipe Covering® Stalastic Insulseal® Insulstic® Swetchek® Finishing Cements® Insulating Cements® Fireproofing Cement® Diatomaceous Earth Blocks

EAGLE-PICHER ONE-COAT, ALL-PURPOSE CEMENT!

A combination insulation and finishing material for temperatures to 1000 F. It's quick setting, rust-inhibitive ... has light color, smooth surface, negligible shrinkage. It has exceptional adhesive qualities on ferrous metals and insulation materials. And it's unaffected by rain or moisture after it sets!

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY • *General Offices: Cincinnati (1), Ohio*

Insulation products of efficient mineral wool — for a full range of high and low temperatures. Technical data on request.

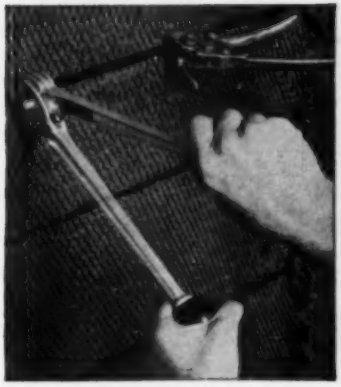
Since 1843.

2172



These efficient, versatile insulations "team up" to give perfect insulation for every major application

For a completely effective, low-cost insulation combination, you can't beat the teamwork of Eagle-Picher Mineral Wool Blankets, Supertemp Blocks, Diatomaceous Earth Blocks and Earth Fill, and Super "66" Cement. They work effectively to give your equipment highest possible thermal efficiency . . . cut operating costs by saving the maximum amount of fuel . . . and help to provide perfect, precise control over temperatures.



EAGLE-PICHER MINERAL WOOL BLANKETS

These blankets satisfy the need for a convenient method of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Mineral wool is felted and secured between flexible metal fabric. Outstanding physical and chemical stability enables Eagle-Picher Blankets to resist water, steam, corrosive fumes and normal vibration.



EAGLE-PICHER SUPERTEMP BLOCKS

Eagle-Picher Supertemp Blocks are lightweight (approximately 16 lbs. per cu. ft.). Can be cut easily with knife or saw to fit off-shaped areas . . . they fit snugly over minor irregularities. They're strong and have high refractory value. Withstand temperatures up to 1700 F. Conductivity at 512 F. approximately 0.53 . . . all standard sizes, from 2" x 18" to 12" x 36" in thicknesses from 1" to 4".



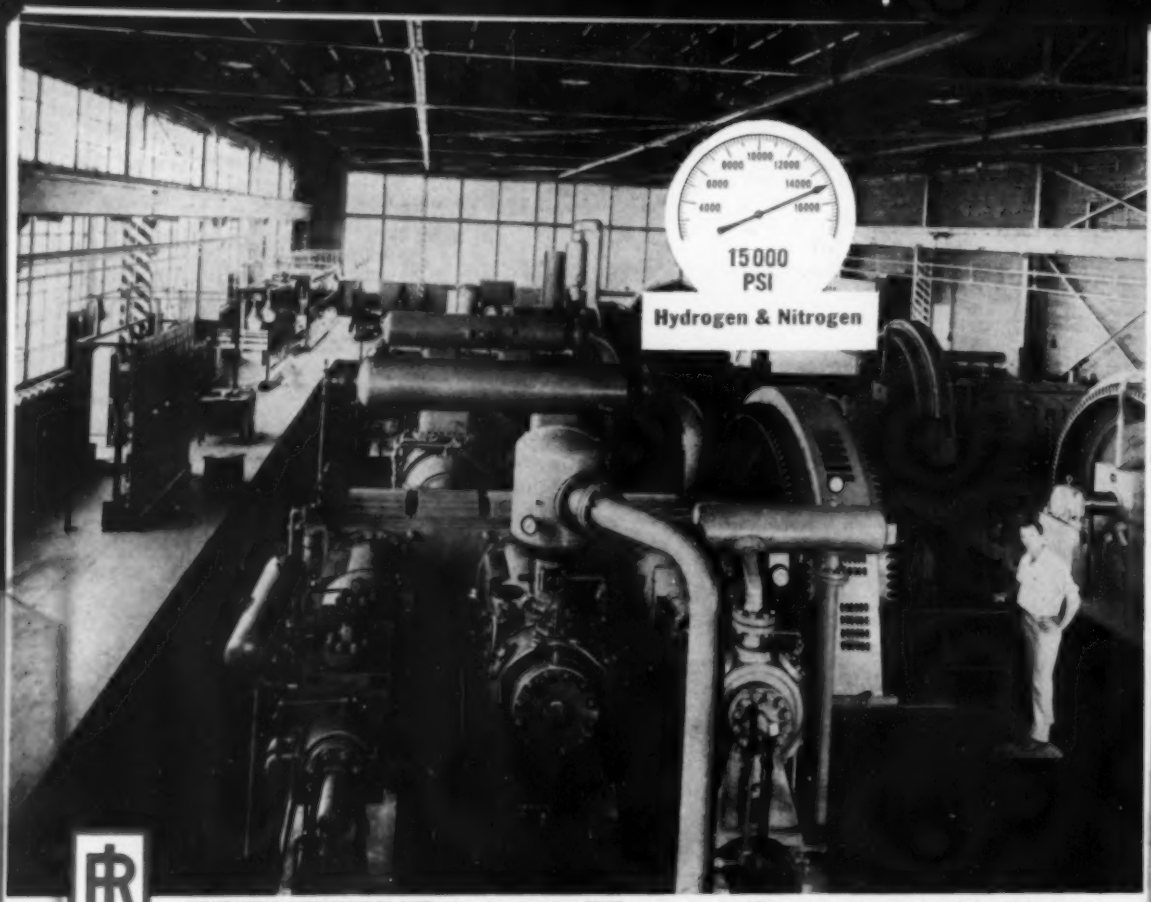
EAGLE-PICHER SUPER "66" INSULATING CEMENT

Super "66" is all-purpose, rust-inhibitive, extremely adhesive insulating cement. "Springy ball" pellets don't collapse after application . . . give great coverage, retain their thermal efficiency. 100 lbs. covers approximately 55 sq. ft. —1 inch thick. Easily applied with trowel, over flat and irregular surfaces. Efficient for temperatures up to 1800 F. Reclaimable when used on equipment whose temperatures do not exceed 1200 F.

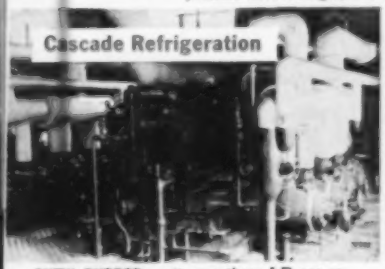


Eagle-Picher, as a member of the Industrial Mineral Wool Institute, urges that you look for this label. It is a certification by the manufacturer that his mineral wool product conforms to Commercial Standard CS 117-49 as issued by National Bureau of Standards, U.S. Department of Commerce in cooperation with the Industrial Mineral Wool Institute, New York, N.Y.

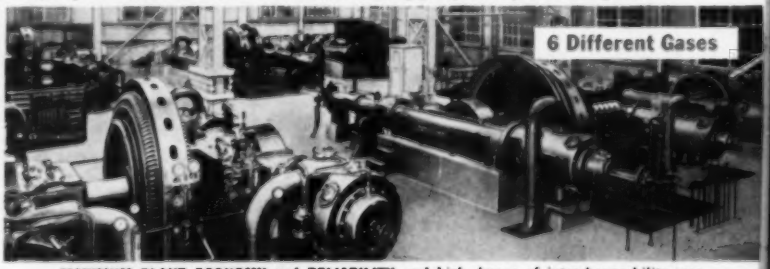




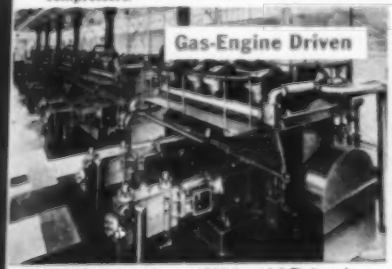
SYNTHETIC AMMONIA PLANT using electric-driven **HHE** compressors totalling 6300 hp . . . The 3500-psi primary compressors have 4 stages, and the 15,000-psi booster units have 2 stages, providing many advantages by placing high-pressure cylinders in separate units. All compressors have the same stroke, and running-gear parts duplicate throughout.



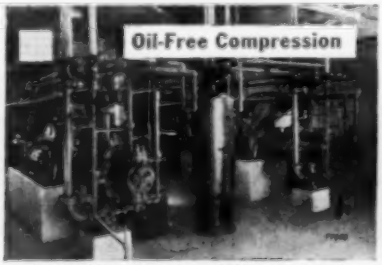
BUTYL-RUBBER unit uses these I-R gas-engine-driven Compressors . . . seven being 300-hp ammonia and five 300-hp ethylene compressors.



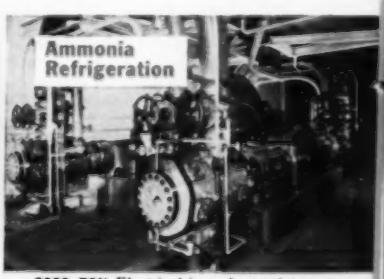
MAXIMUM PLANT ECONOMY and RELIABILITY and high degree of interchangeability, are attained even though each of these six I-R compressors handles a different gas and pressure condition in a chemical plant.



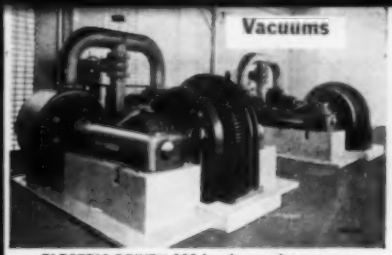
RECYCLING GAS . . . 4800 hp of I-R 4-cycle V-angle compressors . . . 1500 psi intake, 4100 psi discharge.



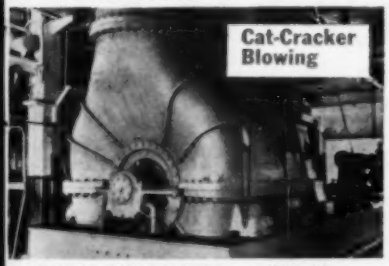
HYDROGEN compressors, 2500 psi, 4-stage . . . two 150-hp I-R units . . . non-lubricated pistons with graphitic-carbon wearing and pressure rings.



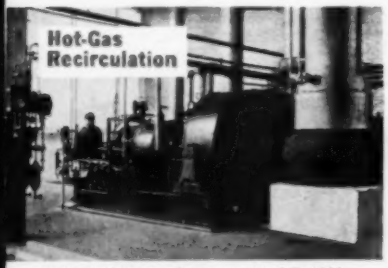
2000-TON Electric-driven heavy-duty ammonia compressor in brewery service . . . (I-R also builds Steam-Jet Water-Vapor Refrigeration units).



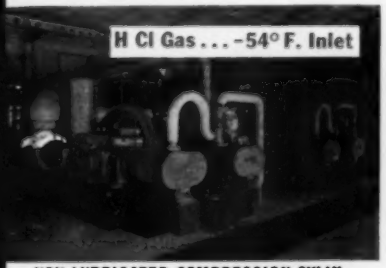
ELECTRIC-DRIVEN 200-hp heavy-duty vacuum pumps in glass-manufacturing plant . . . (I-R also has complete line of steam-jet ejectors and condensers).



5000-hp TURBO-BLOWER . . . turbine-driven I-R multi-stage unit compressing 57,600 cfm to 20 psi.



HYDROFORMING plant uses this I-R 1200-hp single-stage blower . . . up to 300 psi pressure . . . up to 800° F. inlet temperatures.



NON-LUBRICATED COMPRESSION CYLINDERS . . . Two steam-powered compressors in refinery service . . . 225 hp, 240 psia discharge.



12,500 HORSEPOWER TOTAL . . . five I-R 6-stage synchronous-motor-driven compressors handling nitrogen and hydrogen at 4500 psi.

Name your Gas, Name your Pressure, and your Service Conditions

Whatever the problem, you can depend on Ingersoll-Rand's 70 years of experience to meet your process compressor requirements . . .

more efficiently
more dependably
more economically

Pictured here are just a few of the thousands of Ingersoll-Rand process compressors and blowers that are on the job in practically every branch of the chemical, petroleum, and process industries. Every one of them is precision-built to the highest standards to do the particular job for which it was sold. This compressor experience means:

1. *No compressor problem is completely new* to Ingersoll-Rand. Details may differ, of course, but whatever your specific requirements, chances are Ingersoll-Rand has already built a process compressor, reciprocating or centrifugal, for a similar purpose.
2. *Dollar savings to you* in terms of sustained production, safety in operation, and low maintenance costs result from the years of design and manufacturing experience behind I-R compressors.

Our design and application engineers will be glad to help solve *your* compressor problems at any time. Simply get in touch with your nearest I-R representative.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 462-1

Builder of Reciprocating and Centrifugal Compressors

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • OIL AND GAS ENGINES



CLARK Service

BY MEN WHO KNOW BEST

FROM YOUR MATERIALS HANDLING EQUIPMENT

There are two fundamental reasons why CLARK fork-lift trucks, powered hand trucks and industrial towing tractors exceed user expectations:

1. They are better-built—built for long years of usefulness, for easy maintenance and low-cost operation.

2. Clark—and Clark alone—provides a complete, border-to-border and coast-to-coast maintenance and repair service designed to keep your equipment on the job.

Clark's reliable service protects your investment by keeping your materials-handling equipment on the job at top operating capacity. This is the priceless *plus* you get with every Clark purchase.





...coast-to-coast

HOW TO GIVE YOU THE MOST

What You Need When You Need It!

You have no time for fooling around—no stomach for "lip" service, nor "lick-and-promise" service in this day and age. Your machines must be kept rolling if you are to operate at a profit. Clark gives you "work-or-else" service—nothing less—by skilled and genuinely interested mechanics. You get what you need, when you need it.

Every service station stocks genuine Clark parts. And behind these stations is Clark factory service which fills 98% of emergency orders in less than 48 hours! We know of no other materials-handling service that can approach this record—this program.

Clark fork-lift trucks, powered hand trucks and industrial towing tractors solve your materials-handling problems. And Clark's unrivalled service keeps 'em rolling. Clark machines and Clark service are an unbeatable team that plays only for *your* profit:

THESE MEN HEAD UP CLARK'S INCOMPARABLE SERVICE

1—JESS PULVER
ALBANY, NEW YORK
*Industrial Truck Sales, Inc.

2—CHARLES P. KOERBER
BALTIMORE 2, MARYLAND
*Fallsway Spring & Equipment Co.

3—ED RONNING
BIRMINGHAM, ALABAMA
*M-H Equipment Company

4—WOODROW L. KURTZ
BOSTON, MASSACHUSETTS
*Brodie Industrial Trucks, Inc.

5—JOHN VACANTI
BUFFALO, NEW YORK
*Brodie Industrial Trucks, Inc.

6—ROBERT G. GOERS
CHICAGO 21, ILLINOIS
Lift Truck Service Company

7—CHARLES MUMMERT
CINCINNATI 9, OHIO
*Robert C. Young & Company

8—JOE CAMERIERI
CLEVELAND 11, OHIO
*Material Handling Equipment Corp.

9—FRED ROSEBOOM
COLUMBUS, OHIO
*Edward J. Sherry Co.

10—JIMMY CLARKSON
COLUMBIA, SOUTH CAROLINA
*M-H Equipment Company

11—THOMAS RICHARDSON
DALLAS, TEXAS
Industrial Truck Service Co.

12—LYLE SCHMIDT
DAVENPORT, IOWA
The All-Wheel Drive Company

13—P. N. MAHR
DENVER 4, COLORADO
Fork Lift Truck Service Company

14—CHARLES D. REES
DETROIT 13, MICHIGAN
Industrial Truck Service, Inc.

15—MARTIN PETERS
FARGO, NORTH DAKOTA
*Sweeney Brothers Tractor Co.

16—HAROLD HOAG
FRESNO, CALIFORNIA
*Robert H. Braun Company

17—RALPH B. (Red) TAYLOR
GRAND RAPIDS, MICHIGAN
Industrial Truck Service, Inc.

18—A. H. VANHOY
GREENSBORO, NORTH CAROLINA
*Industrial Truck Sales & Service Co.

19—JOE CITAK
HARRISBURG, PENNSYLVANIA
*Brodie Industrial Trucks, Inc.

20—GEORGE OGATA
HONOLULU, T. H.
*Pressed Steel Car Company

21—HARRY DARE
HOUSTON 2, TEXAS
Industrial Truck Service Co.

22—PAUL G. PILKINTON
INDIANAPOLIS 5, INDIANA
*W. A. Marschke & Sons, Inc.

23—E. T. MARKS
JACKSONVILLE, FLORIDA
Forsyth Garage

24—IRL T. OLIVER
KANSAS CITY 8, MISSOURI
*Lift Truck Sales & Service, Inc.

25—FAYE HIGGINS
LOS ANGELES 22, CALIFORNIA
*Robert H. Braun Company

26—C. L. WALDEN
MIAMI, FLORIDA
Walden's Garage

27—R. G. BUCHIGNANI
MEMPHIS 3, TENNESSEE
*Fred J. Vandemark Company

28—WALTER REPINSKI
MILWAUKEE 10, WISCONSIN
*Wisconsin Industrial Truck Co., Inc.

29—EDWARD F. BALL
MINNEAPOLIS 7, MINNESOTA
*Material Handling Engineers, Inc.

30—HENRY BOUDRIAS
MONTREAL 9, QUEBEC
*J. H. Ryder Machinery Co., Reg.

31—JOHN D. LANKTON
NEW HAVEN 13, CONNECTICUT
*C. E. Reutter Corporation

32—A. (ARCHIE) McGUFF
NEW YORK 14, NEW YORK
*Bond Industrial Maintenance Co., Inc.

33—R. F. (CHICK) CHIKAR
NORFOLK, VIRGINIA
*McLean Equipment, Inc.

34—H. V. CONNEY
OAKLAND 3, CALIFORNIA
*Glen L. Codman Company, Inc.

35—LOUIS FRIEDBERGER
PHILADELPHIA 44, PENNSYLVANIA
Philadelphia Engine Rebuilders, Inc.

36—LLOYD BROWN
PHOENIX, ARIZONA
*Robert H. Braun Company

37—JOHN VILSACK
PITTSBURGH 22, PENNSYLVANIA
*Material Handling, Inc.

38—BOB TILLMAN
ST. LOUIS, MISSOURI
*Industrial Truck Service Inc.

39—JACK B. YOUNG
SEATTLE 1, WASHINGTON
*Preston Faller Company

40—RAY WILSON
SIOUX FALLS, SOUTH DAKOTA
*Stan Houston Equipment Co., Inc.

41—BILL TYE
SOUTH BEND 14, INDIANA
*Materials Handling Equipment Corp.

42—L. W. ELLZEY
TAMPA, FLORIDA
J. B. Hardin Hardware, Inc.

43—L. S. (JIM) WILLIAMS
TOLEDO, OHIO
*Kern Truck Sales, Inc.

44—J. JENNER
TORONTO 5, ONTARIO
J. H. Ryder Machinery Co., Ltd.

45—J. O. McCRAY
TULSA 3, OKLAHOMA
Midwestern Engine and Equipment Company, Inc.

46—GORDON ROGERS
VANCOUVER, B. C.
*National Machinery Co., Ltd.

*Sales and Service







CLARK ELECTRIC AND GAS POWERED **FORK TRUCKS**

AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS



INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 8, MICHIGAN

Please send me the new "Time and Place Utility" issue of Material Handling News.

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Firm Name _____

Street _____

City _____ Zone ____ State _____

AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Your Best PROTECTION...

TRADE LESLIE MARK

SELF-CLEANING STRAINERS



LESLIE *Strainer Screens have large, free area to insure ample flow and straining capacity.*

Stop valve connected to Strainer blowoff can be opened, allowing flow of operating fluid to cleanse screen.

Complete *protection* for Reducing Valves, Pump Governors, Temperature Regulators, Turbines, Pumps, Traps, Valves and other equipment against dirt, rust and scale is provided at lower cost by LESLIE Self-Cleaning Strainers.

Protection from foreign material increases the life of equipment and prevents costly down-time. Large free area permits good cleaning with low pressure loss through the Strainer. Self-Cleaning feature allows cleaning of screen without removal from strainer body or shutting off operating fluid.

LESLIE Self-Cleaning Strainers are available in a wide range of sizes from ¼" to 10", in cast iron, cast bronze, cast steel, carbon moly, chrome moly, and stainless steel, with screwed, flanged or socket welding connections for pressures to 1500 lbs., temperatures to 1000°F. Screens of filter cloth, fine wire mesh or perforated sheet stock in a wide range of materials and perforations. Stocked and sold by Industrial Distributors.

LESLIE "POROMET" Filter

For superfine cleaning of fluids or protection of equipment with small ports, the LESLIE "Poromet" *Cartridge Type Filter permits separation of particles as small as .001", with no more pressure loss than a pipe bend. In small size* LESLIE *Strainers the "Poromet" Filter can be used to replace a regular screen without change to the Strainer.*

LESLIE engineering know-how is available to solve your Strainer problems with standard Strainers or specially designed units to handle unusual problems.

Look for LESLIE REGULATORS under "Valves" or "Regulators" in your classified telephone directory in the following cities where LESLIE factory trained engineers are located:

Albany, N. Y. · Albuquerque, N. M. · Atlanta, Ga. · Baltimore, Md. · Beaumont, Texas · Birmingham, Ala. · Boston, Mass. · Bridgeport, Conn. · Buffalo, N. Y. · Chicago, Ill. · Cincinnati, Ohio · Cleveland, Ohio · Dallas, Texas · Denver, Colo. · Des Moines, Ia. · Detroit, Mich. · Duluth, Minn. · El Paso, Texas · Greensboro, N. C. · Greenville, S. C. · Houston, Texas · Kansas City, Mo. · Kingsport, Tenn. · Los Angeles, Cal. · Louisville, Ky. · Memphis, Tenn. · Miami Springs, Fla. · Milwaukee, Wis. · Minneapolis, Minn. · Mobile, Ala. · New Orleans, La. · New York, N. Y. · Orlando, Fla. · Philadelphia, Pa. · Pittsburgh, Pa. · Ponca City, Okla. · Providence, R. I. · Richmond, Va. · Rochester, N. Y. · Rutherford, N. J. · Salt Lake City, Utah · San Francisco, Cal. · Seattle, Wash. · St. Louis, Mo. · Syracuse, N. Y. · Tarrytown, N. Y. · Tucson, Ariz. · Wilmington, Calif. · Youngstown, Ohio · Montreal, Que., Can. · Toronto, Ont., Can. · Vancouver, B.C., Can. · Bruxelles-Forest, Belgium

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ESTABLISHED 1900

LESLIE CO.

1157

279 Grant Avenue, Lyndhurst, New Jersey

FLOATLESS LEVEL CONTROLS • PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS • PUMP GOVERNORS • TEMPERATURE REGULATORS • SELF CLEANING STRAINERS • AIR HORNS • STEAM WHISTLES

Houghton protects every customer *by protecting every drum with* Tri-Sure Closures



E. F. Houghton & Co. of Philadelphia manufactures one of the largest lines of industrial lubricants, metal-working oils, and textile oils and chemicals.

The company built a national reputation on *purity of product*. So since 1936, Houghton has made it company policy to *protect* that purity by equipping every drum with Tri-Sure Closures.*

Houghton, like so many shippers of quality oils and chemicals, uses Tri-Sure Closures year after year, because customers recognize the Tri-Sure *Flange*, *Plug* and *Seal* as positive protection from leakage, pilferage and contamination.

Remember that buyers the world over prefer products that are *securely* packaged. Add another sales feature to your products by specifying "Tri-Sure Closures" on drum orders.

AMERICAN FLANGE & MANUFACTURING CO. INC.
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

TRI-SURE PRODUCTS LIMITED
ST. CATHARINES, ONTARIO, CANADA

*The "Tri-Sure" Trademark is a mark of reliability backed by 29 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

For 15 years Tri-Sure Closures have guarded the Houghton Line of Industrial Oils, Lubricants and Chemicals

SPROUT WALDRON MUNCY, PA.

pointers to BETTER PROCESSING

EQUIPMENT INFORMATION FOR PROCESSING PLANTS



GLUE MANUFACTURER

Gets Product Uniformity ...Saves Man Hours and Floor Space—with

Sprout-Waldron Vertical Batch Blender

PROBLEM:

A prominent hide glue manufacturer found it necessary to reduce mixing and packing costs. Since Sprout-Waldron was experienced in this phase of glue processing...had previously furnished equipment for similar operations—it was a natural assignment for S-W Engineers.

The source of the trouble was soon traced to mixing operations...just before packaging. Here, obsolete methods and equipment were running production costs way out of line. Excessive man hours and valuable floor space were considered necessary evils. Almost three hours were consumed in mixing a 10,000 lb. batch. And, an operator had to "stand by" under dusty conditions during the process.

SOLUTION:

A 300 cu. ft. S-W vertical, self-cleaning batch blender equipped with weighing unit now does the job, in conjunction with one bucket elevator. This combination *saves space, is dust-tight, and fast.*

RESULTS:

1. Perfect batch uniformity
2. Mixing time reduced from 3 hours to 15 minutes
3. 125 sq. ft. of floor space saved
4. Mixing and packing costs cut in half

If you have a *mixing or blending problem,* why not take it up with Sprout, Waldron & Co., Inc., 15 Waldron St., Muncy, Pa.


Size Reduction


Mixing & Blending


Bulk Materials Handling


Product Classification


Pelleting & Cubing

Processing Equipment

SPROUT WALDRON MUNCY, PA.

191

SPROUT WALDRON
S W
MUNCY, PA.

pointers *to* **BETTER PROCESSING**

EQUIPMENT INFORMATION FOR PROCESSING PLANTS

For New Processing Ideas and Equipment–

See the SPROUT-WALDRON Exhibit at the Chem Show!

You'll find Sprout-Waldron's display at the same old stand (Booths 550-553) ... bigger and better than ever!

The "eye-catcher" will be a pneumatic materials handling system conveying a granular product around the 20 ft. booth through a 2" plastic pipeline.

But, Sprout-Waldron's broad line of equipment will be illustrated best by the 250 sample jars of processed materials—ranging from crushed glue chips to flock. Each sample is actually a successful case history of a processing problem *solved!* Perhaps the answer to your present problem will be found here. Or, write Sprout, Waldron & Co., Inc., 15 Waldron St., Muncy, Pa.



What's unusual about U. S. Rubber's new plastic coating?

For one thing, this new coating, called *U.S. Royalguard Protective Coating*, has very high film flexibility and adhesion. It protects:

Against attack by splash, drip, and spray from corrosive chemicals:

- **Chemical Processing Equipment**
- **Tanks**
- **Pipes**
- **Tank Cars**
- **Fittings**

Against weathering and rust:

- **Structural Steel Parts**
- **Machinery**



U.S. ROYALGUARD plastic coating being applied to yarn-carrying wheels used by textile industry. It is air-drying...no baking or other special treatment is required to produce a tough, flexible, highly corrosion-resistant film.



SAMPLE PLATE coated with Royalguard is bent in vice to demonstrate its high film flexibility and high adhesion. It can be used on steel, aluminum, concrete, hardwood or composition board.

Royalguard is a one-coat system... no primer is required. It will find its broadest use in chemical processing, rayon and cellophane production, photo finishing, pulp and paper manufacturing, sewage disposal, filtering, electroplating and in mining. Write to address below.

PRODUCT OF U.S. RUBBER

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION, ROCKEFELLER CENTER, NEW YORK 20, N. Y.



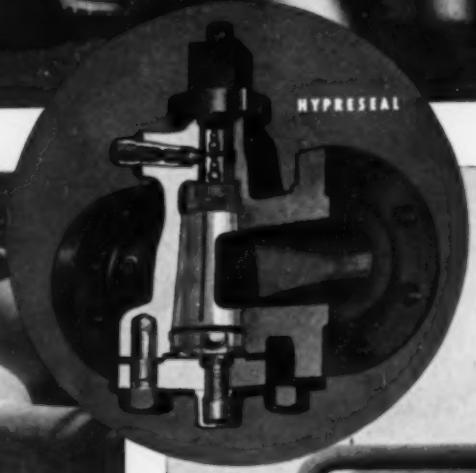
Nordstrom Valves

...NOW AUTOMATICALLY LUBRICATED WITH Trade Mark Hypermatic Pats. Applied for

NORDSTROMS *hold the line!*

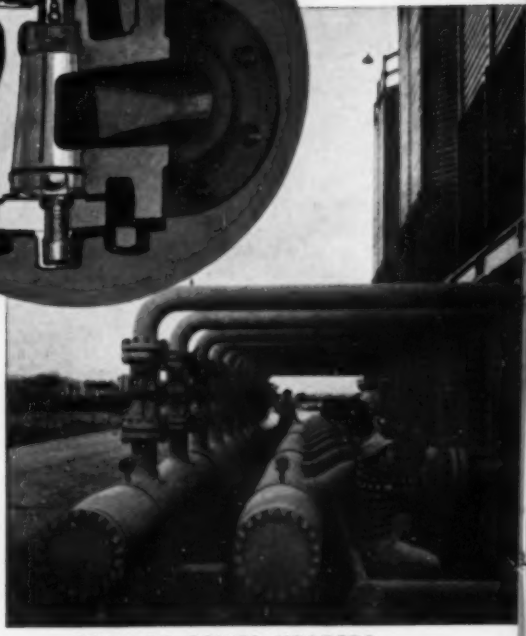


OIL PIPE LINE TERMINAL





INSULATED—HOT OR COLD
OIL FIELD MANIFOLD



COOLING TOWER HEADERS



Nordstrom
LUBRICATED VALVES

ROCKWELL MANUFACTURING COMPANY
400 North Lexington Avenue, Pittsburgh 8, Pa.
Atlanta, Boston, Chicago, Columbus, Houston, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco, Seattle, Tulsa . . . and leading Supply Houses. Export: International Division, Rockwell Manufacturing Company, 7701 Empire State Building, New York 1, N. Y.

GLYCERINE



IMPORTANT FOR PROTECTIVE COATINGS...



...IMPERATIVE FOR NATIONAL DEFENSE!

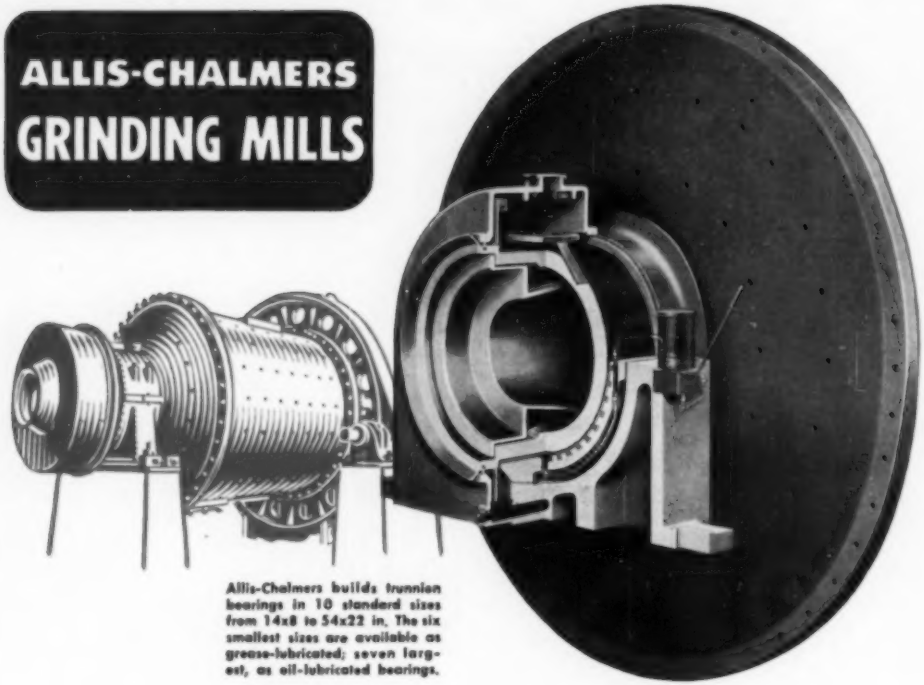
Why do so many top-quality coatings rely on Glycerine-derived alkyd resins or ester gums? These versatile components add film toughness . . . long life . . . and improved color retention to paints and varnishes. Special finishes depend on them, too. Corrosion-inhibitors, de-icing paints, anti-rust compounds, grease-proof coatings – all take advantage of Glycerine's outstanding range of properties!

Today, Glycerine is in strong national demand. Especially for coatings that must meet military specifications. So if you find supplies temporarily short, here's why: Glycerine's outstanding versatility is answering both civilian and defense coating problems at the same time!

GLYCERINE PRODUCERS' ASSOCIATION
295 Madison Ave., New York 17, N. Y.

Trunnion Bearing Engineered to End Alignment Troubles

ALLIS-CHALMERS
GRINDING MILLS



Allis-Chalmers builds trunnion bearings in 10 standard sizes from 14x8 to 54x22 in. The six smallest sizes are available as grease-lubricated; seven largest, as oil-lubricated bearings.

BALL AND SOCKET design of this Allis-Chalmers trunnion bearing provides a spherical seat that corrects for *any* minor misalignment of mill and bearing. Load is always distributed evenly across the full face of the bearing.

A complete, self-enclosed oiling system is contained in the bearing housing. Soft babbitt cannot score polished trunnion surface.

Large oil-lubricated trunnion bearings are provided with a hand-operated lubricant pump for floating the mill prior to starting. This eliminates high starting torque, an important feature, since 75 percent of bearing wear occurs during initial starting after shut-down. Motor inrush current is decreased.

Allis-Chalmers builds trunnion bearings in lengths approximately one-half the diameter, in agreement with the latest engineering trend. Ample bearing area keeps bearing pressure low, prolongs bearing life.

The Allis-Chalmers representative in your area can give you more facts about bearings and other features of Allis-Chalmers grinding mills. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3479

Pulverator is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.



Pulverators | Vibrating Screens | Jaw Crushers | Motors | Gyratory Crushers | Kilns, Coolers, Dryers



WITH **VEELOS** THE ADJUSTABLE V-BELT

You Always have the Right Size Belt When You Need It!

When endless v-belts fail and your stockroom does not have the size you need . . . that means loss of time and production. But if you're wise and have Veelos, the adjustable v-belt, in stock, this can't happen to you.

With Veelos, *any size* v-belt can be made up right from a single reel. Just four reels of Veelos in the O, A, B and C widths can replace up to *316* sizes of endless v-belts on any drive in your plant. If your machines call for only one or two widths, you stock only those reels of Veelos and *you always have the right size belt when you need it.*

Veelos has other advantages, too. Replacement time is less (never necessary to remove outboard bearings). Matched sets that stay matched can be made up instantly. You get full, vibrationless, power delivery because belt tension can be held uniform.



For full production, always— standardize on Veelos, the adjustable v-belt. Write for your copy of the VEELOS DATA BOOK today.

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

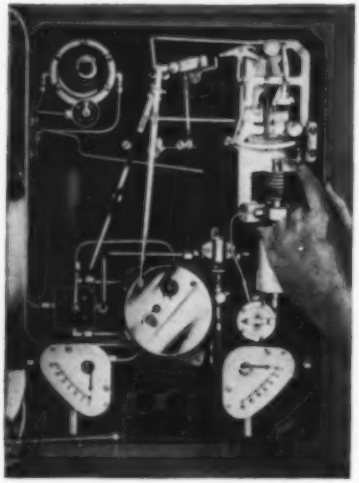
Made in all widths in three types: regular, oil-proof, static conducting. Also double V in A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

MANHEIM MANUFACTURING & BELTING COMPANY • MANHEIM, PA.

Anybody Can Take Care of a BRISTOL SERIES 500 CONTROLLER



Plant operating men quickly become familiar with it . . . and like to use it



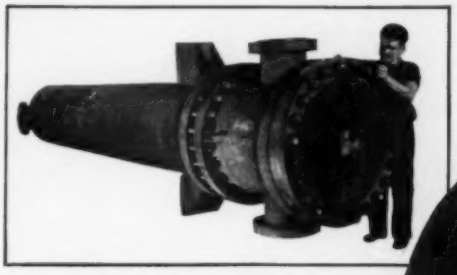
Only One Simple Adjustment

Write or call your local Bristol representative. And write for Bulletin A120. THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 20, Conn.



BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



High-level reactor exchanger **built for one of the world's largest Ethanol plants, showing copper-lined channel and removable copper pass rib with unusual reinforcement designed to give support against high pressure drop at elevated temperatures.**



How A.O.Smith protected heat transfer equipment from the effects of Phosphoric Acid Corrosion and Hydrogen Diffusion

The problem was solved for Stone & Webster Engineering Corporation of Boston, engineers and designers of the Chemical Project of the British Petroleum Chemicals, Ltd., at Grangemouth, Scotland, with this deoxidized copper-lined, high-level reactor exchanger.

Our metallurgical laboratories ran tests on various materials in collaboration with Stone & Webster Engineering Corporation and Shell Development Company, the process licensor, which aided them in establishing deoxidized copper as the most suitable material for the protective lining.

Our welding laboratories then determined procedures to be used in the shop for welding copper to copper, copper to steel, and silver-soldering copper to steel.

Combining all laboratory assistance with the experience of the A.O. Smith heat transfer and mechanical design groups made production of this unit possible.

A.O. Smith has been retained as consultants on today's most complex heat transfer problems and the facilities employed in solving them are available to you.

INDUSTRY COMES TO A.O.SMITH WITH HEAT EXCHANGER PROBLEMS

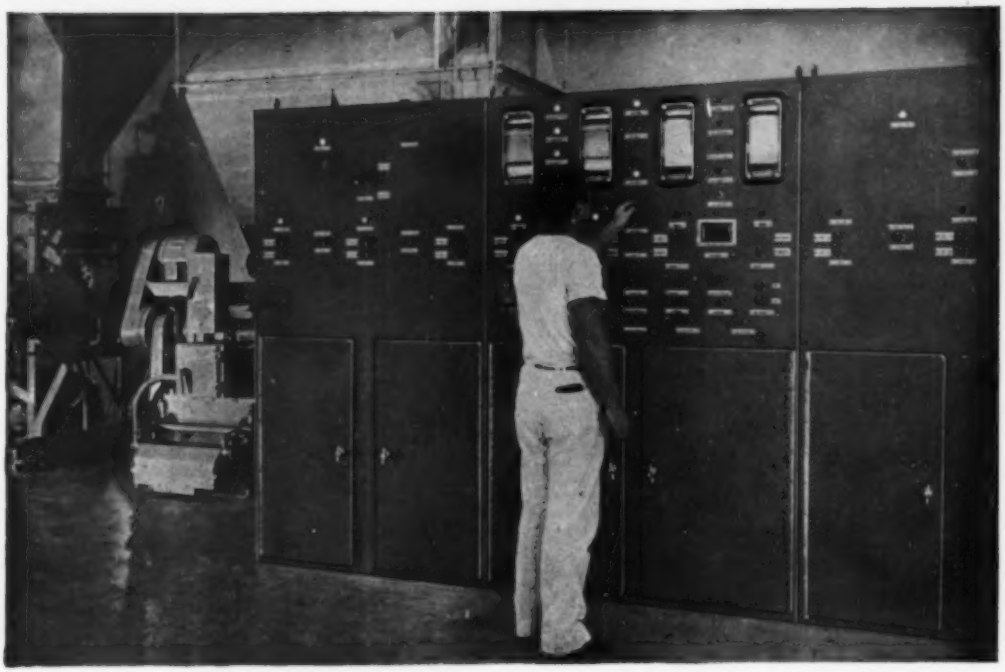


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RICHARDSON PROPORTIONING EQUIPMENT WORKS FOR Johnson & Johnson

PROBLEM:

To insure invariably accurate proportioning of ingredients, proper timing of mixing, and efficient conveying of materials for the production of baby and prickly heat powder at Johnson & Johnson's Baby Products Plant at Cranford, N. J.

SOLUTION:

Richardson engineered and supplied automatic scales with a master control panel which coordinated the operation of the scales, the existing conveyors, mixers and sifters. Result: A consistently uniform product for the filling machines.

A product like baby powder or prickly heat powder *must be uniform*—always. High customer acceptance depends on a product whose texture and composition remains the same month after month, year after year—the result of accurate blending. Making a profit or taking a loss because of high operating cost depends on rapid and accurate blending. That's why Johnson & Johnson called in Richardson to engineer a feeder–weigher–mixer system that would be *fast—automatic*—and *ACCURATE*.

Richardson has specialized in engineering and building systems for materials handling by weight for more than half a century. Through these years a tremendous backlog of practical experience has been built up. As a result, we maintain . . . *and have proved time and again* . . . that there's no problem in pre-weighing, proportioning and mixing materials that can't be solved efficiently and economically . . . that the uniformity of any end product can be consistently maintained without need for heavy capital investment. Why not ask a Richardson engineer to survey your plant and submit suggestions? To do so puts you under no obligation and may pave the way to increased production and profits at lower operating costs.

Richardson Scale Co., Clifton, New Jersey. Feeder—Weigher Systems of All Types: Automatic Bulk Weighing Hopper Scales, Including Conveyor-Feed Types—Continuous Feeder-Weighers—Automatic Bagging Scales—Bag-Sewing Conveyors—Packers—Process Control Panels. *Branch offices in:* Atlanta • Boston • Detroit • Minneapolis • Cincinnati • Wichita • Montreal • Omaha • New York • Pittsburgh • San Francisco • Toronto • Buffalo • Chicago • Philadelphia • and Houston.

Richardson

MATERIALS HANDLING BY WEIGHT

6373

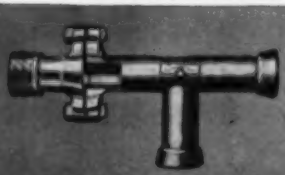

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Names Known to Millions...
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have called on Chemical Plants Division to design, build and equip their highly-efficient
SYNTHETIC RESINS PLANTS
These firms are indicative not only of leadership in their fields, but of the wide experience Blaw-Knox can apply to the varied mechanical and chemical problems involved in each instance.
And Synthetic Resins are just one of the many products for which Chemical Plants Division designs, engineers and equips complete, ready-to-run plants of proved efficiency.
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BLAW-KNOX CONSTRUCTION COMPANY
PITTSBURGH • TULSA • NEW YORK • PHILADELPHIA
CHICAGO • BIRMINGHAM • WASHINGTON, D. C.

...The COMPLETE Line for ALL CORROSION-RESISTANT piping problems

It's TRI-CLOVER



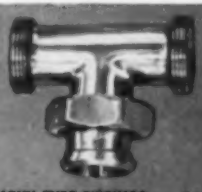
"ZEPHYRWELD"® WELDING FITTINGS ... SS Type 304, 347 and 316—Inconel and other SS analyses. Fabricated in I.P.S. and O.D. Tube Size, ⅛ in. thru 24 in.—ells, tees, crosses, flanges, adapters, etc.



CLINICAL END FITTINGS ... Stainless Steel Type 316—Inconel and other SS analyses. Complete line of ells, tees, crosses, laterals, reducers, etc., sizes from ¼ in. thru 4 in. O.D. Features: Light weight—low cost—simple, fast installation—leak-tight—flanges of all types for every application—easily adapted to all other fitting types.



RECESSED-END FITTINGS ... Stainless Steel Type 304-347-316. Low cost, light weight fittings designed for fast, simple soldering, brazing or socket welding, in sizes from ⅛ in. thru 24 in. Full line of elbows, return bends, tees, crosses, adapters, etc.



"SANITARY" TYPE FITTINGS ... Stainless Steel and Tri-Alloy (Nickel Alloy). Sizes from ¼ in. thru 4 in. O.D., in full range of fitting types. Designed and approved as meeting 3A Standards throughout, incorporating numerous exclusive design and construction features.

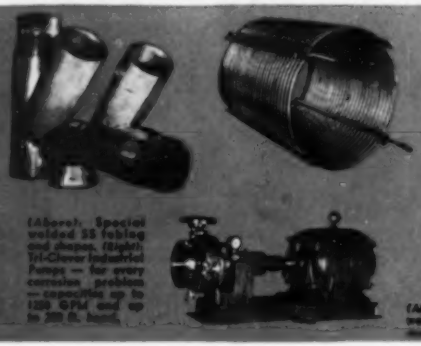


FLANGED and SCREWED FITTINGS and VALVES ... Stainless Steel Type 304-347-316. Complete range of fitting types. This quality line meets the demand wherever flanged and screwed fittings and liquid lines are required. Clean-cut, accurate threads match standard I.P.S. piping.

SPECIALIZED MANUFACTURING FACILITIES

When it comes to expert welding and fabricating of complex assemblies, you just can't beat the speed and accuracy offered with TRI-CLOVER'S exclusive Heli-Arc Atomic Hydrogen Welding... a specialized semi-automatic process that assures highest quality and FULL corrosion resistance. *Shown here are a few typical examples of the wide variety of jobs we handle every day.*

COMPLETE ANNEALING FACILITIES



(Above): Special welded SS tubing and sheets. (Right): Tri-Clover Industrial Pumps — for every corrosion problem — capacities up to 1200 G.P.M. and up to 300 ft. head.

(Left and Right): Stainless Steel coils of every size and description to meet specific requirements.



(Above): Standard Tri-Clover butt-welded fittings furnished in flanged assemblies.

Tri-Clover MACHINE CO.
Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

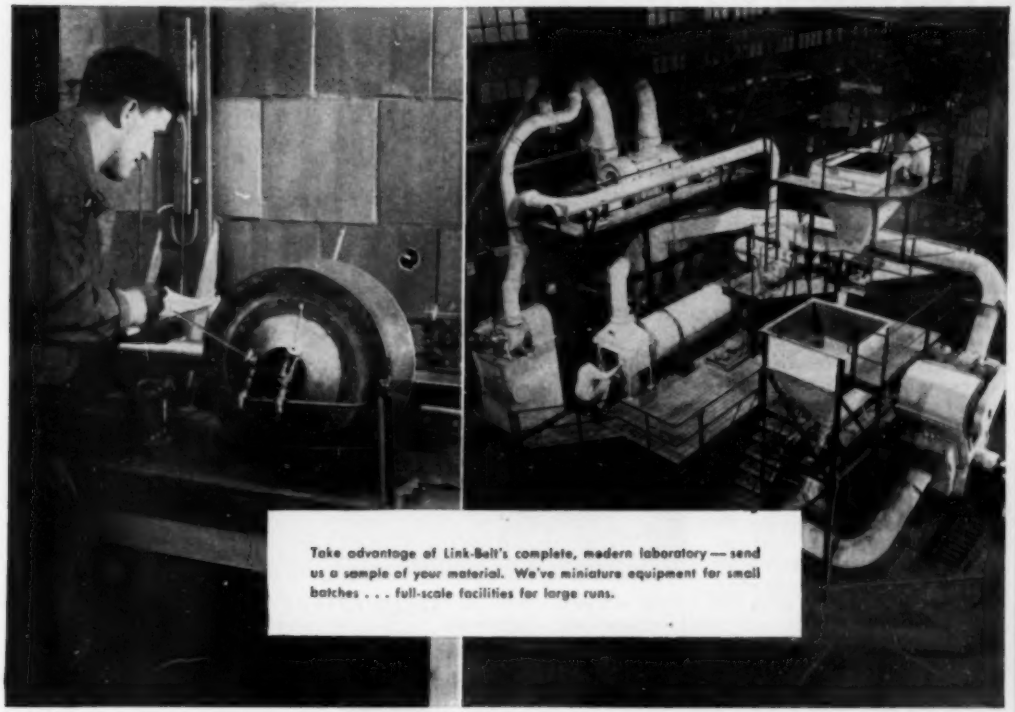
THE Complete LINE

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

Be sure to see **TRI-CLOVER'S COMPLETE LINE** *on display at the* **1951 CHEMICAL EXPOSITION**
New York • *Nov. 26-Dec. 1* • *BOOTH 498*

AN INVITATION
to manufacturers with drying, cooling or roasting problems...

LINK-BELT will test a pound or a ton of your material



Whatever size the sample, we will test-run your material, work out procedures in this laboratory that can be duplicated in your plant

If your production has been delayed or handicapped by drying, cooling, or roasting obstacles, there's an easy, no-obligation way you can get an immediate answer . . .

Follow the lead of hundreds of others who have utilized Link-Belt's scientific laboratory to test-run their materials. As a result of this testing and research, scores of different materials are now being processed by Link-Belt Dryers installed all over the world.

And here's an added Link-Belt service — if you can't ship samples, we'll put a unit on loan right in your own plant. Find out how you can put these Link-Belt services, plus Link-Belt experience, to work for you. Call the Link-Belt plant or office nearest you.



LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12.404

ALCOA

Alcoa Heat Exchanger News



Published by Aluminum Company of America

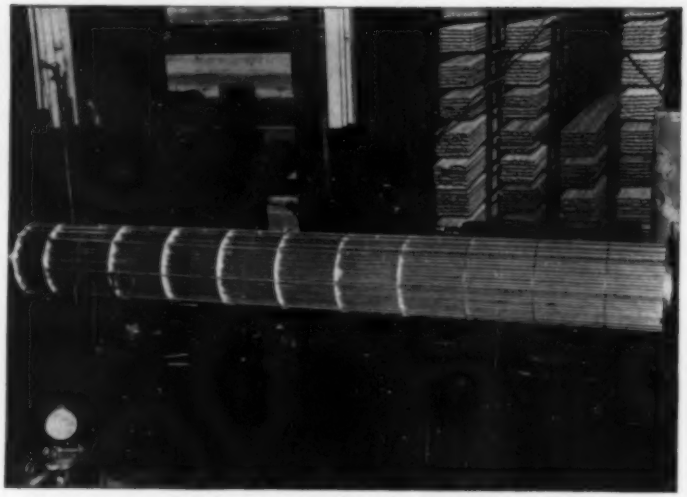
Rearmament needs severely limit the manufacture of aluminum heat exchanger tubes. But we realize that the purchase of refinery and processing equipment requires long study of economic and performance factors. That is the reason for this message.

El Paso Natural Gas Company Saves ⅓ in Cost of Glycol-Amine Exchanger Tubes

About three years ago, the Fluor Corporation started investigation in corrosion problems occurring with steel exchanger tubes in gas-treating plants utilizing Fluor's glycol-amine process. They conducted extensive research to find suitable replacements for steel. (Results of these tests were reported in the April, 1950, and February, 1951, issues of "Petroleum Refiner" Magazine.) Aluminum and 4-6 cr., ½ moly. steel tubes were most economical of the corrosion-resistant materials tested.

So when Fluor Corporation was selected to engineer glycol-amine exchangers at one of the large new plants of El Paso Natural Gas Company, they recommended Alcoa 3S-H14 aluminum tubes for the service. These tubes cost 30 per cent less than seamless mild steel and 60 per cent less than 4-6 cr., ½ moly. steel. Fabrication of the units was done by Griscom-Russell.

Aluminum heat exchanger tubes have been so successful in resisting corrosion in glycol-amine plant service that over 100,000 pounds of aluminum are now used in that service. Experimental work has indicated over one year of service with no sign of corrosion. In handling, shipping and fabricating costs, the aluminum tubes saved 200,000 pounds over the heavy metal tubes they replaced. Their greater ductility permits easier roll-in.



ALCOA OFFERS BOOKLET



This 24-page booklet will answer many of your questions about Alcoa Tubes. It covers fabrication techniques, alloy selection, chemical and petroleum applications. It describes tube cleaning, inhibitors, cathodic protection. It contains complete information on fluid flow and heat transfer. There are formulas, tables and specification data. Write for your free copy today. ALUMINUM COMPANY OF AMERICA, 1860L Gulf Bldg., Pittsburgh 19, Penna

THESE APPLICATIONS ARE NATURALS FOR ALUMINUM TUBES:

Petroleum

Condensers handling hydrocarbon fractions such as gasoline, naphtha, gas, oil, etc.
Vapor recovery condensers
Lube oil coolers
Natural gas compressor aftercoolers
TCC overhead condensers
Recompressor aftercoolers
Hydrogen sulfide gas coolers
Furfural condensers and heat exchangers
Propane chilling
Wax sweaters
Lean oil—rich oil exchangers
Arsine solution coolers
Glycol-amine solution coolers and heat exchangers.

Chemical

Butanol
Ethanol
Ethylene Glycol
Glycerin
Hydroabietyl
Isopropanol
Methanol
Phenol
Propylene Glycol
Acetaldehyde
Formaldehyde
Furfural
Heptaldehyde
Acetic acid
Butyric acid
Stearic, Palmitic, Maleic Oleic acids
Naphtha
Ricinoleic acid
Acetanilide
Ammonia
Hydrogen Cyanide
Nitric acid (concentrated)
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Hydrogen Sulfide
Benzene
Dichlorobenzene
Gasoline
Gelatin
Hydrogen Peroxide
Turpentine
Xylene



Got a BIG Filtration Problem?

Test it first—*at low cost* with a NIAGARA Pilot Filter

A Rented Pilot Filter Gives You the Facts on:

- Filterability of new products
- Flow rates per unit filter area
- Clarity of filtrate under various conditions
- Ideal cycle lengths
- Best cake-washing methods
- What filter-aid to use
- Optimum filter-aid quantities
- Adaptability of filter to your process
- Filtration cost comparisons

Thinking of going to modern high-speed pressure filtration? For a moderate rental fee, one of these complete Niagara pilot filters will give you accurate test data, upon which you can safely select plant-scale filtration equipment.

Made of Type 316 stainless steel at all liquid contact points, the pilot filter can be rented with or without steam jacket and stainless accessories shown. It demonstrates in your own plant the simplicity of operation, high filtration rates, and labor and maintenance economies you get with modern, totally-enclosed pressure-leaf filters.

For details on this rental service, send the coupon or write us today.

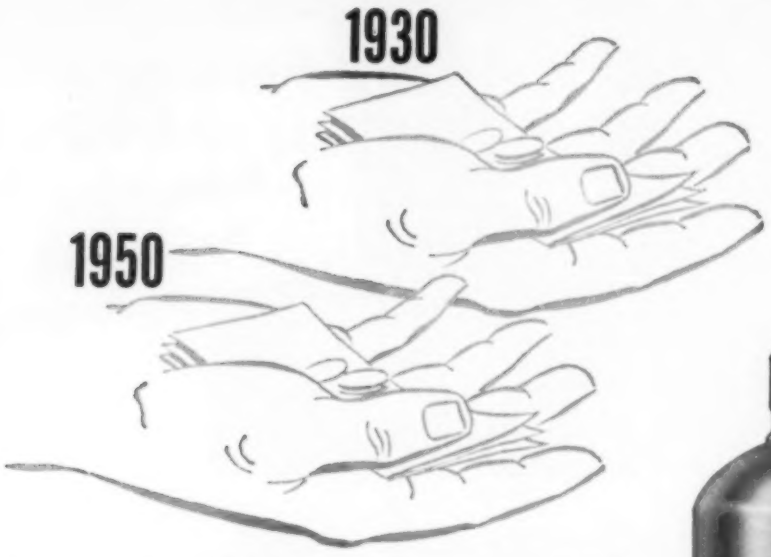
Niagara Filter CORPORATION

IN EUROPE—NIAGARA FILTERS EUROPE, 36 Leidsegracht, Amsterdam-C, Holland

NIAGARA FILTER CORP., 3687 Main St., Buffalo 14, N.Y.
Please send details on Niagara Pilot Filter rental.

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HACKNEY LIGHTWEIGHT CYLINDERS



it costs NO more to ship

150 lbs. of anhydrous ammonia today than in 1930...even though freight rates are up 41%!

Hackney Lightweight Cylinders offset higher freight rates for many products. These facts about anhydrous ammonia shipments illustrate possible savings to all compressed gas manufacturers.

In 1930, it cost a shipper $4.64 to send 150 lbs. of anhydrous ammonia from St. Louis to Dallas. Freight rates for carload shipments were low ($1.16 per 100 lbs.), the cylinder was heavy (250 lbs.).

In 1950, it cost a shipper $4.65 to send 150 lbs. of anhydrous ammonia from St. Louis to Dallas. Freight rates are higher ($1.63 per 100 lbs.), *but the cylinder is lighter* (135 lbs.).

Not only that . . . it costs about 25% *less* to return the empty cylinder *today*, a definite economy.

Hackney Lightweight Cylinders, fabricated from high strength steels, give you cost-saving light weight, with no sacrifice in strength. The Hackney Deep Drawing Process assures uniform sidewall thickness and eliminates all excess weight. Change to the lighter, easier-to-handle Hackney Cylinder now! Write us for further information.

See our Exhibit at the New York Chemical Exposition—Booths No's.: 348, 350, and 352.



Hackney MILWAUKEE

PRESSED STEEL TANK COMPANY

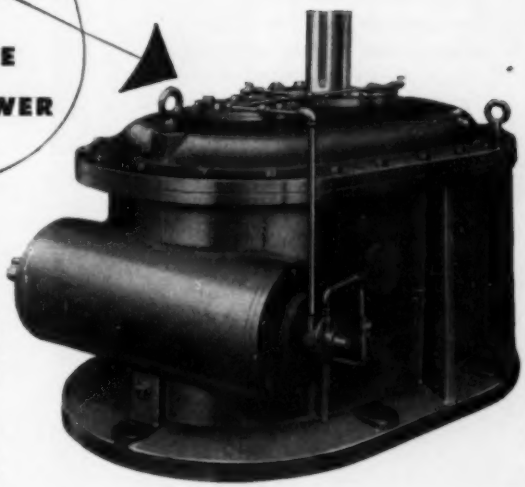
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A FOOTE BROS.
WORM-HELICAL DRIVE
MAY PROVIDE THE ANSWER



● Rugged strength, the ability to stand up under punishing loads, the highest possible efficiency — these are characteristics of Foote Bros. Worm-Helical Drives.

Input shafts are horizontal, output shafts vertical, up or down — making these units ideal for use in chemical plants, pulp mills or wherever materials must be agitated or mixed.

Foote Bros. Worm-Helical Drives are available in ratios from approximately 25 up to 285 to 1—capacities up to 128 h.p. See your Foote Bros. representative or mail the coupon for information.

FOOTE BROS. GEAR AND MACHINE CORPORATION
4545 S. Western Boulevard • Chicago 9, Illinois

Whatever your requirements in power transmission, you will find exactly the drive best suited to your needs in the complete Foote Bros. line of enclosed gear drives and gearmotors. Check the coupon indicating the drive in which you are interested.

FOOTE BROS.
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Please send bulletins on drives checked below.

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Company ..... *Position* .....
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4 WAYS TO DE-IRON Materials Carried on Conveyor Belts

DINGS magnets offer a variety of ways to meet problems caused by tramp iron—problems such as fires, explosions, machinery damage or product purification.

One of these ways is the ideal way and its choice is a joint affair—yours and ours. Outline your application to Dings. You can rely on their unbiased recommendation.

The magnets listed are but part of a complete line of magnetic separators which includes magnets for chutes, ducts, wet applications or fully self contained units. For a description of the complete line . . .

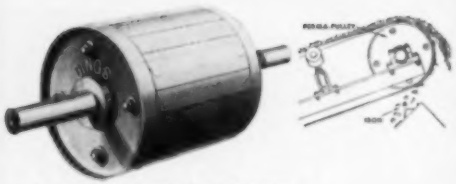


Send For Catalog C-5000 A

In it can be found the answer to any magnetic separation problem.

DINGS MAGNETIC SEPARATOR CO.
4730 W. Electric Avenue, Milwaukee 46, Wis.

Dings



1. DINGS PERMA-PULLEYS

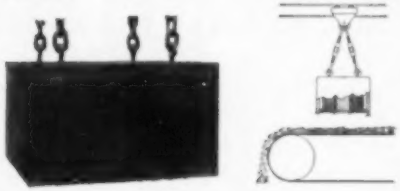
INTENSELY concentrated magnetic strength near the surface makes this the magnet to use where burden depths do not exceed 3". Installed as head drive pulley, tramp iron removal is fully automatic, simple. *Non-electric, permanently energized* it can be installed and forgotten. Catalog C-1007 A gives details.

Powerful, air-cooled electro magnetic pulleys are available for burden depths exceeding 3". Low operating cost, long life and extreme power characterize this work-horse of the Dings line. Catalog C-1001 A.



2. DINGS PERMA-PLATES

PERMA-PLATES are the simplest, most economical magnets available. Installed over the conveyor belt, they are extremely effective on shallow burden depths. *Non-electric and permanent.* Perma-Plates can be made self-cleaning. Catalog C-1205 A.



3. DINGS SUSPENDED RECTANGULARS

FOR the difficult jobs. Power close and power that searches down 12" to yank tramp iron out. Triple pole, double gap design gives edge to edge protection that can't be surpassed. Install horizontally, vertically or at an angle. Self-cleaning fully automatic models also available. Another model, the DEEP BURDEN Rectangular, is effective at distances to 18". Catalog 301-A.



4. DINGS MAGNETIC DETECTOR

THE Dings Magnetic Detector instantly signals when any magnetic object passes through the detector zone. Can be hooked up to sound an alarm and stop the belt. Ideal where the infrequency of tramp iron does not warrant the use of a magnetic separator, or where heavily loaded, high speed conveyor belts make iron extraction magnetically an impossible task.



for the plant you are planning for tomorrow, it will pay you to investigate now

Cameron

NON-LUBRICATED LIFT-PLUG VALVES

No matter what the service may be, here is a plug valve that fits. Featuring a removable seat and plug, it can be easily and economically trimmed in any desired corrosion-resistant alloy.

The Cameron Lift-Plug Valve requires no lubrication, either for easy operation, or obtaining a tight seal. Think of the man hours and grease it will save you. This feature also prevents contamination of line products by valve lubricants. There is nothing to clog meter equipment either.

Let us send you a booklet that tells you the complete story of this remarkable valve. Like other plant operators who use these valves in particularly difficult services, you may find them to be the answer to all of your problems too.

Cameron **IRON WORKS, INC.**

P. O. BOX 1212, HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y. Represented in the sterling area by: British Oilfield Equipment Co., Ltd., Duke's Court, St. James's, London S.W.1, Eng.

MONSANTO
CHEMICALS — PLASTICS

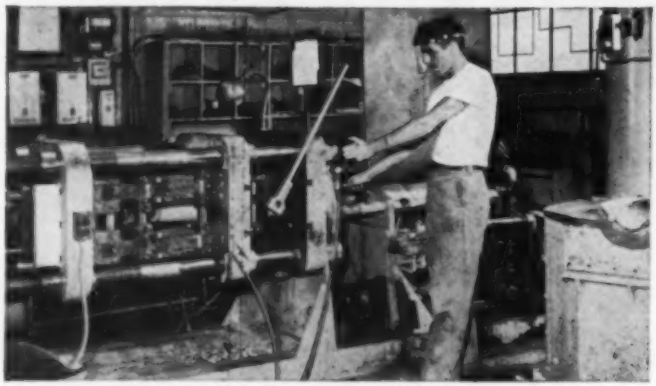
FOR YOUR INFORMATION

Every month Monsanto publishes these pages of pertinent information which may be helpful to you. This issue discusses:

Hydraulic Fluid Cutting Oil Additive Defoaming Agent
Plasticizers Wetting Agent Intermediates

Additional information on any of these subjects will be provided by any Monsanto Sales Office in response to your request by memo or letter.

PROOF OF PYDRAUL F-9 SAFETY



Richard N. Patterson, operator of a die-casting machine in the Smith-Johnson Corporation plant, escaped serious injury because his company had switched to Pydraul F-9.

No flash...no fire... when hydraulic line breaks at die-casting machine. Employes escape injury.

Officials and employes of Smith-Johnson Corporation, Los Angeles, are mighty glad the company switched to Monsanto Pydraul* F-9, nonflammable-type hydraulic fluid.

A line leak caused Pydraul F-9 to be sprayed over the area of a die-casting machine and zinc melting pot. There was no flash . . . no fire . . . no blast.

Although the operator of the machine was drenched and fluid was sprayed on about a half dozen men who were observing his job, no one was seriously injured. With an ordinary hydraulic fluid, there would probably have been a flash fire. Property could have been destroyed . . . lives lost.

You can switch to safe, efficient Pydraul F-9 simply by draining your present fluid and refilling.

The nonflammability of Pydraul F-9 has been proved in numerous tests such as:

Pydraul F-9 did not flash or ignite when sprayed, dripped or flooded on molten metal heated to approximately 1,500° F.

Pydraul F-9 did not flash or ignite when sprayed, at 1,000 p.s.i., into the 6,000° F. zone of an oxyacetylene welding torch flame.

Pydraul F-9 gives you economy and efficiency as well as safety. It shows high resistance to mechanical shear and chemical breakdown. It is high in lubricity and does not corrode metals ordinarily used in machine construction.

For details on safe, efficient, economical Pydraul F-9, mail the coupon or contact the nearest Monsanto Sales Office.

* * * * *

MAIL COUPON for a copy of Monsanto's new Technical Bulletin No. O-78, which gives details on the use of orthonitrobiphenyl as a plasticizer and chemical intermediate.

INVESTIGATE SANTICIZER 8 for molded plastics...coatings...adhesives

Monsanto's Santicizer* 8 is a plasticizer with a diversity of applications that is available for immediate shipment. Santicizer 8 is a mixture of N-ethyl ortho and para toluene sulfonamides. Read these important facts on the uses of Santicizer 8:

In Molded Plastics: One of the leading plasticizers for nylon. Imparts high tensile strength, brilliance and polish, elongation and flexibility to cellulose acetate sheeting and film. Practically insoluble in hydrocarbons, giving outstanding service in products that must withstand gasoline and oil.

In Coatings: Highly compatible with nitrocellulose lacquers; gives excellent brilliance and gloss, flexibility, moisture resistance and adhesion. Compatible with proteins and with zein and casein coatings to at least 50% by weight, improving flexibility, water resistance, gloss and adhesion. An excellent dye solvent, it enhances the brilliance of oil-soluble colors.

In Adhesives: A first-rate plasticizer for use in hot-melt adhesives. Particularly useful for imparting tack and adhesion to polyvinyl acetate and polyvinyl butyral resins. Adds adhesive qualities to lacquers and coatings.



For further information or a sample of Santicizer 8, mail the coupon or contact the nearest Monsanto Sales Office.

* * * * *

Ortho-ETHYLNITROBENZENE is available for immediate shipment from Monsanto. Widely used as an intermediate, orthoethylnitrobenzene probably has many undiscovered uses. It may take the place of a chemical that now is difficult to obtain. Contact nearest Monsanto Sales Office for prices and shipping information.

HB-40 extends primary plasticizers ...lowers costs

Regardless of your supply situation on plasticizers, have a look at Monsanto HB-40. You can get it by the drum or carload and at a price so low that it can be the means of lowering your production costs. You can benefit from HB-40 availability and economy without sacrificing quality in your vinyl products.

Monsanto HB-40 (partially hydrogenated terphenyl) is essentially colorless, odorless and practically nontoxic. Since it is nearly water-white, properly stabilized HB-40 can be used in clear and pastel-shaded plastics. Even with substantial amounts of HB-40, such products have excellent heat and light stability.

HB-40 is used as a coplasticizer or as an extender for primary plasticizers in:

Vinyl extrusions—Profile, tubing, belting and wire coating, both electrical and non-electrical.

Vinyl pastes—Organosols and plastisols, for fabric coating, free film, floor coverings and dip coatings.

Vinyl slush moldings—Plastisols for slush molding operations.

Vinyl calendering—Thin film and sheeting, both supported and nonsupported.

For technical information on the use of Monsanto HB-40, mail the coupon or contact the nearest Monsanto Sales Office.

Santolube 52 improves cutting oil

The addition of Monsanto Santolube® 52 to cutting oil steps up tapping efficiency . . . steps up threading efficiency . . . lengthens tool life.

As little as 2% of Santolube 52 may replace as much as 10% fatty oil component of certain cutting oil types and yet give improved tapping and threading efficiency.

Santolube 52 contains no sulfur or chlorine, therefore it makes practically no difference in the ratio of these elements in your cutting fluid.

Mail the coupon for data on Santolube 52 and for details on its use in cutting oils.

Monsanto AE-1 proves efficient in number of industrial processes



Without AE-1



With AE-1

Monsanto AE-1, a new, high-molecular-weight alcohol-ester, is efficient in a number of industrial applications. It is low in price and available in quantity.

Its use as a defoaming agent is illustrated. The picture at the left shows a solution without AE-1. At the right, you see the same solution to which a small amount of AE-1 has been added. AE-1 is used as a defoaming agent in the production of ethyl alcohol, glycerol, yeast, polystyrene latex water dispersions and in other applications.

Suggested uses include: Plasticizer and coplasticizer for melamine and urea resins, polyvinyl alcohol; in printing ink; solubilizing agent and anti-blooming agent for pentachlorophenol wood preservatives.

Mail the coupon for a copy of Technical Bulletin No. P-140, describing AE-1.

Santomerse No. 1 efficient wetter

If you have processes requiring an efficient wetting agent, emulsifier or detergent, take a good look at Monsanto Santomerse® No. 1.

Santomerse No. 1 is efficient in hard or soft water . . . in hot or cold solutions . . . in acid or alkaline baths. Santomerse No. 1 can be used in operations where the pH is critical because it assumes the pH of the solution in which it is used.

Why not investigate Santomerse No. 1 now? Mail the coupon for a copy of Monsanto's booklet, "*Santomerse No. 1 All-purpose wetting agent and detergent.*"

MONSANTO CHEMICAL COMPANY, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

*Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

SEND INFORMATION:
- ☐ HB-40. ☐ Santolube 52.
- ☐ Ortho-Ethylnitrobenzene.
- ☐ Santicizer 8. ☐ Pydraul F-9.

SEND LITERATURE:
- ☐ Bulletin O-78, Ortho-Nitrobiphenyl.
- ☐ Bulletin P-140, AE-1.
- ☐ Booklet, Santomerse No. 1.

SEND SAMPLE: ☐ Santicizer 8.

MONSANTO CHEMICAL COMPANY
1700 South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, information, literature or samples as indicated at the left.

Name ..... Title .....

Company .....

Street .....

City ..... Zone ..... State .....

ARMSTRONG "BLAST" TRAPS SPEED UP HEATING

of Single Pipe Coils, On-and-Off Multiple Coils, Unit Heaters, etc.

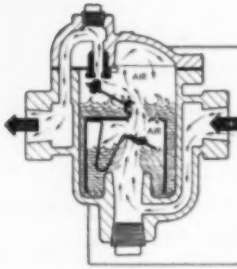


IN equipment where large amounts of air accumulate when the steam is turned off, and where the air can be pushed out ahead of the steam, Armstrong "Blast" Traps provide remarkably fast heat-up. A corrosion resistant invar and stainless bi-metal strip holds open a very large vent which lets air whistle right through the trap when equipment or lines are cold. As soon as steam reaches the trap, the bi-metal closes the big vent.

Armstrong Blast Traps combine the benefits of quick heat-up with the dependable service of mechanical traps. There is no bellows to leak or collapse due to high pressure. In fact, the traps are hydraulically tested at 500 lbs. pressure before they leave the factory.

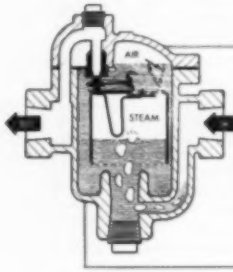
Call your nearby Armstrong Representative for details and prices.

AIR WHISTLES RIGHT THROUGH



VENT OPEN

Note large air bubbles "whistling" through large thermic-control vent to be discharged with condensate through open trap valve. Shaded grey area is condensate.



VENT CLOSED

After accumulated air and condensate are discharged, large vent closes. Small vent is always open to handle ordinary volume of air entering trap.

ARMSTRONG MACHINE WORKS

858 Maple Street • Three Rivers, Michigan



THE ARMSTRONG STEAM TRAP BOOK tells all about Armstrong Blast and Standard Traps—where to use them and how to select and install them. You are welcome to a copy. Just write for it.

SEE OUR CATALOG IN SWEET'S

ARMSTRONG STEAM TRAPS



With Esso Solvents multi-storage availability is assured too!

STORAGE FACILITIES and WATER TERMINALS in industrial centers give added convenience to the users of Esso Solvents. Shipments are made to meet users' requirements . . . by tank cars, tank trucks or drums. Specify Esso Solvents for dependable, convenient delivery right to your door!

YOU GET ALL 6 OF THESE IMPORTANT FEATURES WITH ESSO SOLVENTS

1. **Multi-storage availability** — water terminals in industrial centers.

2. **Uniformity** — made in modern refineries from carefully selected crude oil sources.

3. **Economy**—A storage facility near you for low freight cost and quick delivery.

4. **Controlled evaporation** — available in a wide range of evaporation rates with precise characteristics to meet your requirements.

5. **Solvency** — Esso aliphatics and Solvesso aromatics cover both high and low solvency ranges.

6. **Modern handling methods** — separate tank storage, pumping lines, tank cars and trucks, are used throughout in all Esso Solvent handling operations.

Esso Solvents: versatility and dependability with controlled high quality.

ESSO

PETROLEUM SOLVENTS

SOLD IN: Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY
Boston, Mass. — New York, N. Y. — Elizabeth, N. J.
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Charleston, W. Va.—Charlotte, N. C.—Columbia, S. C.
Memphis, Tenn.—New Orleans, La.

Like a Fuse for Electric Power Load . . .



SAFETY HEADS *for* PRESSURE LOAD

It would be hard to conceive of an electric power application without fuses to afford relief in case of overload. When the fuse element ruptures it breaks the circuit—to save the line and equipment and prevent fire.

When the load is pressure of gas or liquids—BS&B Safety Heads give that same instant, full, pipe-sized relief in the same simple, positive manner by the rupture of a disc. Super-accurate pressure "fuses," Safety Heads will rupture within ± 5% of the pre-determined pressure. Discs are available within a range of 5 lbs. to 40,000 lbs. The resulting opening is unrestricted—as complete as the break in a fuse. No other pressure relief device acts as fast to prevent damage to equipment, property or personnel.

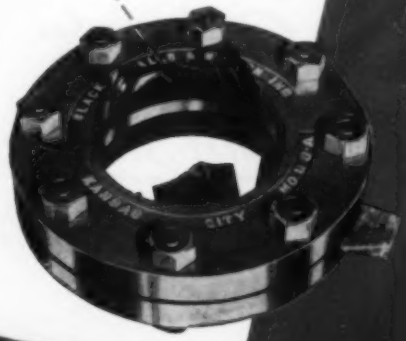
Safety Head action is positive because there are no moving parts to break or to wear out, become fouled or fused at critical moments or prove inadequate to relieve a sudden excessive pressure surge

Whether your pressure applications are for air, gas or liquids—bland or corrosive—BS&B is equipped to provide Safety Heads for them, with pre-tested discs of the proper metal element, designed to rupture at the pre-determined pressure and temperature specified for safety. Used as primary relief devices or to protect or supplement relief valves, BS&B Safety Heads are accurate, code-accepted for your pressure lines or vessels.

Write today *for free catalog and complete details. There is no charge for a complete analysis of your pressure problem by the BS&B laboratory and engineering staff.*

BLACK, SIVALLS & BRYSON, INC.

Dept. 34-N 7500 East 12th St.
Kansas City 3, Missouri



SAFETY
BS&B
HEADS

WHEREVER ACCURACY COUNTS...

You Can Count on...

CLIMAX
BS&B
CONTROLS



RUN OIL COMPANY'S big, modern Natural Gas plant at Delmita, Starr Co., Texas —where 99% of the automatic valves and controls are Climax.

For control of pressures, temperatures, levels and flow—industries look to Climax Controls for the exacting reliability they require.

Accuracy is initiated at the BS&B Climax Controls division, where every control and valve must undergo rigid tests before delivery; and where engineers, metallurgists and laboratory technicians are constantly exploring and developing new materials, new methods, new and improved products, and new ideas.

In the Chemical, Petro-Chemical, Oil and Gas Industries, especially, the name "Climax" has become synonymous with efficiency and trouble-free performance.

At the International Chemical Exposition, *November 26 through December 1, you will have an opportunity to see these latest developments in Climax Controls at booths 496 and 497. We invite your visit. If you cannot attend, why not write for the latest issue of the Climax Controls catalog, on your company letterhead.*

BS&B

BLACK, SIVALLS & BRYSON, INC.

Climax Controls Division, Dept. 60-N

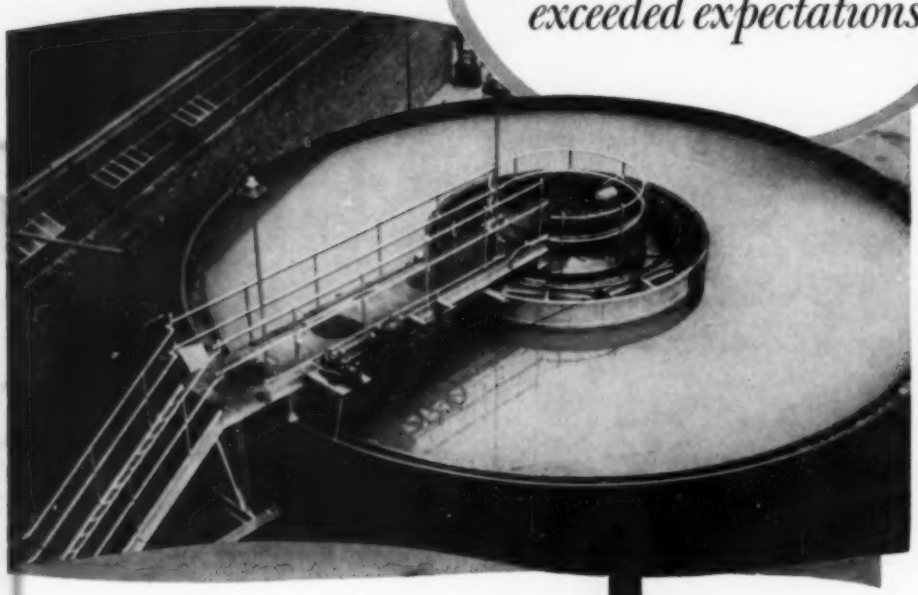
7500 East 12th Street Kansas City 3, Missouri

The Norristown Magnesia and Asbestos Company had a difficult problem in the treatment of its asbestos fiber wastes. It experimented with many methods. A Cyclator pilot plant proved that it could meet the problem... and the actual installation is surpassing pilot plant results!

Norristown Magnesia and Asbestos Company Cyclator. Gilbert Associates, Inc., Consulting Engineers



Where others failed... **Cyclator®** *exceeded expectations*



THE PROBLEM

Treatment of asbestos fiber wastes from mill board, insulation and wool felt products containing varying amounts of talc, carbon black and scrap material. Problem further complicated by shock loads occasioned by dumping of beaters without warning, which increased per cent of solids 2 to 3 times.

THE SOLUTION

Installation of a 45-foot diameter Cyclator and a Vortex Grit Remover.

THE RESULTS

Suspended solids reduction ranging from 94.5% to 99.7%. Sludge concentration is easily held to between 1.5 and 2.5% by weight of solids which can be conveniently handled. Higher concentrations are possible, up to 6% having been obtained. Effluent is re-used for process water. Grit is removed from fibers, so that sludge can be re-used in mill.

SKILLED ENGINEERING

and painstaking research are responsible for the ability of Infilco equipment to handle really tough jobs, and contribute to cost-saving and space-saving superiority on any job. That's why outstanding concerns throughout the world invest in Infilco know-how and experience for the answer to their water conditioning, waste and sewage treatment problems.

For further information on the Cyclator write for Bulletin No. S-5650.

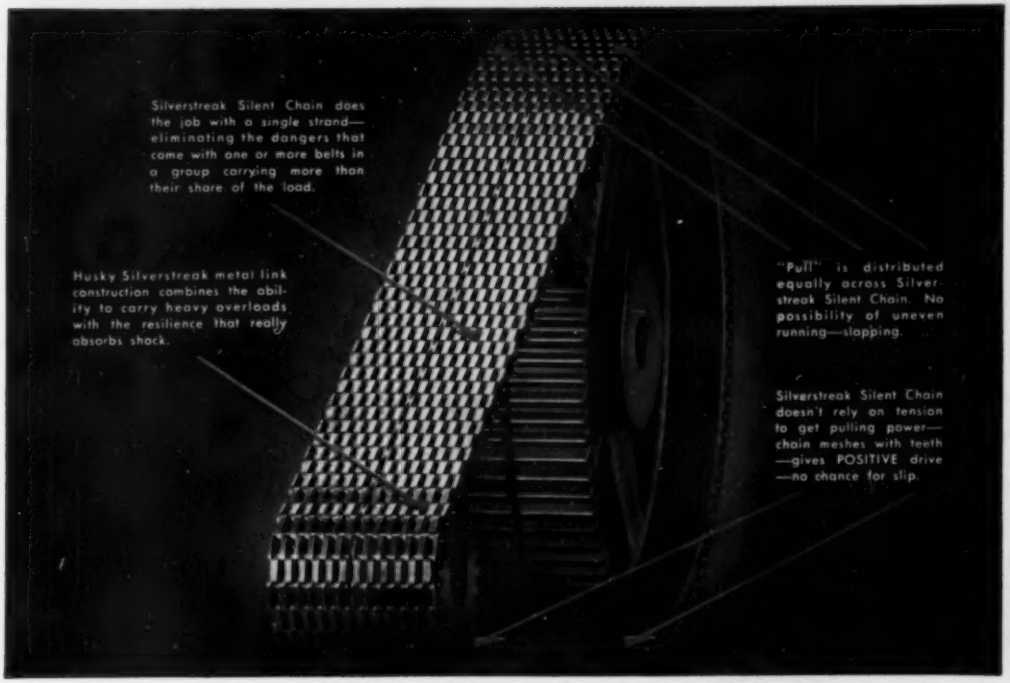
INFILCO

INFILCO, INC., *Tucson, Arizona*

FIELD ENGINEERING OFFICES IN 26 PRINCIPAL CITIES

World's Leading Manufacturers of Water Conditioning and Waste-Treating Equipment

Get full rpm transmission...



LINK-BELT Silverstreak Silent Chain Drives

Slip-proof
Slap-proof
Shock-proof

TAKE the proven road to increased production — through the best in high-speed power transmission. You'll find Link-Belt Silverstreak Silent Chain Drives are 98.2% efficient. With normal maintenance, you have a *positive* drive that runs for years and years.

And note this important point — on extremely short centers Silverstreaks lose none of their efficiency. What's more, reduction ratios as high as 10-to-1 are frequently used. Both of these Silverstreak features save you valuable space.

One test will prove to you why thousands of production-minded engineers have standardized on Link-Belt Silverstreak Silent Chain Drives.

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.

New FISHER Type MO

AVOIDS NECESSITY OF BY-PASS



Fisher Type 57-T diaphragm motor valve with side mounted Type MO handwheel operator in section.

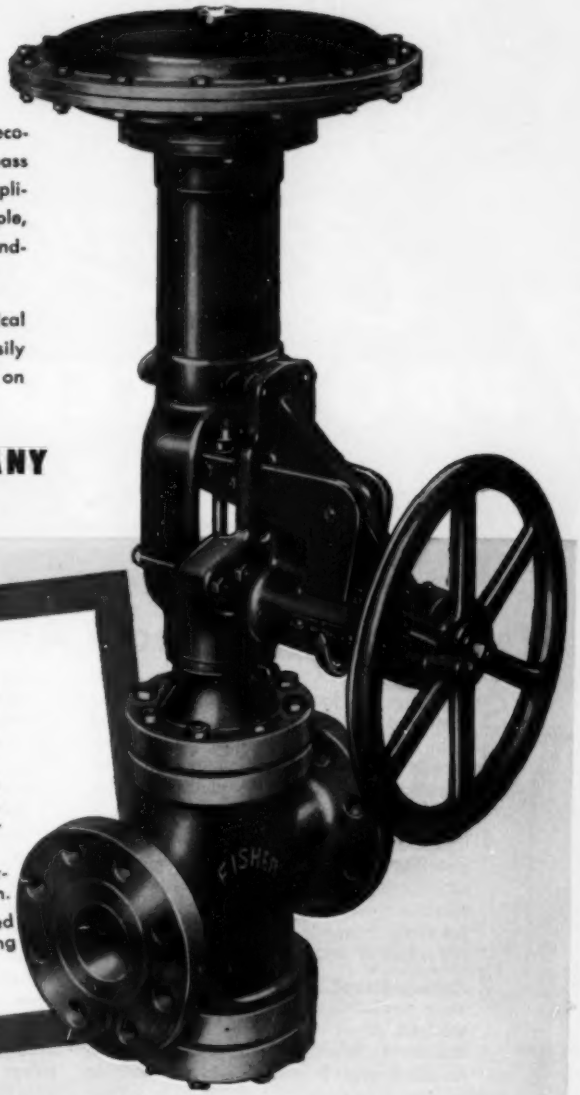
DESIGN FEATURES

1. Manual operator may be used to override automatic operation, either to close or open valve at operator's discretion.
2. The manual operator may also be used as a travel stop in either position; that is, valve may be set for automatic operation and manual operator adjusted to stop valve from completely opening or completely closing.
3. Setting manual operator in the neutral position allows valve to be under full pneumatic operation.
4. Diaphragm may be replaced while manual operator is used to control flow of fluid.
5. Manual operator is mounted on side of control valve for accessibility and ease of operation.

FISHER

WORLD LEADER IN THE MANUFACTURE OF PRESSURE

Manual Operator



In some applications it may be desirable or economical to place responsibility of the by-pass function upon the control valve. For these applications, select the **Fisher Type MO.** It is a simple, rugged, economical, continuous connected handwheel operator that will handle this problem.

Construction places the handwheel in a vertical plane, making it more accessible and more easily handled than handwheel commonly mounted on top of diaphragm case.

FISHER GOVERNOR COMPANY
MARSHALLTOWN, IOWA

CONSTRUCTION FEATURES

1. Handwheel fitted with spring loaded ball and socket recess to retain wheel in position when not in operation.
2. May be mounted on control valves in field that have tapped bosses on yoke. Requires only new diaphragm rod, adjusting screw and stem connector.
3. Grease packed radial and thrust bearings insure long life and easy operation.
4. Handjack operating screw constructed with pitch to give adequate operating power.

REGULATORS AND IN RESEARCH FOR BETTER PRESSURE CONTROL . . .



Let You Forget About Atmospheric Hazards

Shown here are four basic types of Century Protected Motors which are designed to resist the dangers of hazardous atmospheres. A properly selected Century motor—with the right protection—is the ideal combination for a long life of satisfactory performance.

1 **Open Protected**—Form J, general purpose motor—meets the needs for most installations where operating conditions are relatively clean and dry. The top half of the motor frame is closed to keep out falling solids or dripping liquids.

2 **Splash Proof Motor**—gives the necessary protection where plants must be washed down—keeps water out of the motor even when a hose is applied directly on the frame. It also provides protection against rain, snow, sleet and ice for outdoor installations.

3 **Totally Enclosed Fan Cooled Motor** — protects against dusts, mist or fog that might be detrimental to the vital parts of the motor. The inner frame protecting the motor is sealed to keep out harmful matter.

4 **Explosion Proof Motor** — protects against atmospheres charged with explosive dusts or gases. They carry Underwriters' label for specific kinds of hazards.

Century builds a complete line of alternating and direct current motors in a wide range of types and kinds—in sizes from 1/6 to 400 horsepower.

Specify Century motors for all your electric power needs.

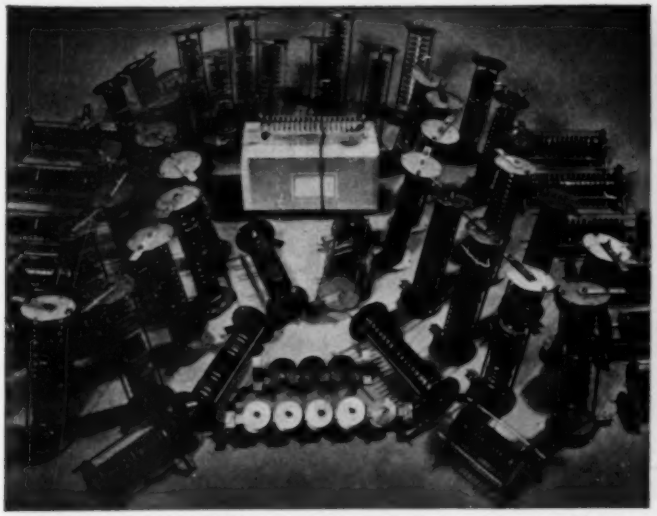
Century Electric Company is celebrating its 50th year in the electrical industry.

CE-8329

Century C MOTORS

CENTURY ELECTRIC COMPANY 1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities



SPOOL-TYPE SPECIMEN HOLDERS permit testing several materials under service conditions without risk of mechanical damage. Specimens make no contact with each other or with plant equipment . . . thus, galvanic effects are prevented.



ASSEMBLING A CORROSION TEST SPOOL. Specimens are machined to specified dimensions, and expose exactly 0.5 sq. dm. when mounted for test.

Help for solving your INDUSTRIAL CORROSION PROBLEMS...

Available for solving your specific problem is a vast amount of information on industrial corrosion.

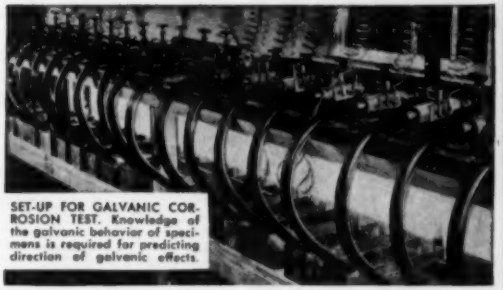
Acquired and catalogued by The International Nickel Company's Corrosion Engineering Section, this fund of data is constantly being increased.

Valuable information is obtained in various ways...for instance, by cooperative field tests in which specimens are exposed to actual plant operating conditions. Also, by fundamental investigations in the laboratory and by tests that duplicate, so far as practical, existing or expected conditions where plant tests are impractical.

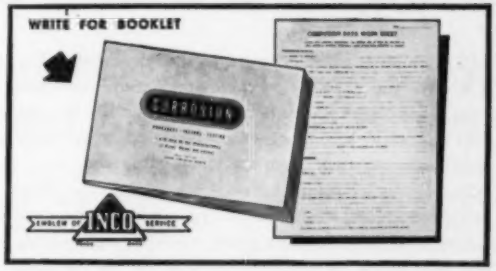
A great deal of important data comes from INCO's large scale marine testing stations at Kure Beach and Harbor Island, and from stations having industrial and rural atmospheres. In addition, technical literature, reports, and manufacturer bulletins contribute useful information.

Our files contain data from more than 2,000 plant tests on some 40,000 metal and alloy specimens. All information is tabulated on standard forms, and a punch card key sort system facilitates finding specific data.

We freely provide the Corrosion Data Work Sheet, illustrated, for presenting your specific problems.



SET-UP FOR GALVANIC CORROSION TEST. Knowledge of the galvanic behavior of specimens is required for predicting direction of galvanic effects.



Whenever you need assistance in solving a corrosion problem, our Corrosion Engineering Section will gladly cooperate with you. A free copy of the new booklet entitled "Corrosion" may help you defeat corrosive attacks...write for it now.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Here's how YOU can help to SPREAD THE SUPPLY OF STAINLESS STEEL



1. Let us know ALL the conditions of use.
2. Tell us what fabricating methods you'll employ.
3. Tell us when you will actually NEED the material in the shop.
4. Give us a choice of multiple sizes that will cut with minimum scrap loss and wastage.
5. Hurry your working scrap back to the mill.

ALL stainless producers are in the same boat. We have the capacity to melt much more stainless steel if we could get more alloying materials. So, our first concern—with your help—is to make as much stainless as possible from the alloys allotted to us.

For example, suppose that 18-8 Allegheny Metal (18% chromium, 8% nickel) is ordered for a job where a 17% straight chromium grade would actually satisfy the conditions of use and the fabricating methods employed. In effect, 1% of chromium and the 8% of nickel would be wasted—could have been used to make more stainless steel. That's where Points 1 and 2 above come in.

Our next concern, after selecting the right steel for the job, is to make sure it is used right—with the least amount of wastage in conversion or fabrication, and the least amount lying idle in stock or scrap. That's where Points 3, 4 and 5 come in.

Help us to make this conservation program work, to help *you* get the stainless steel you need. ● *For any assistance, printed or personal, address Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

You can make it **BETTER** with

Allegheny Metal

AL TIME-TESTED STAINLESS STEEL

WBD 3093

IT TAKES A LOT OF COLD CHILLS

To drape a Lady with a Log



Wood pulp to synthetic fabrics is no trick. But in a new hush-hush variation of the cupro-ammonium process, exothermic heat generated in reducing wood pulp must be *evenly* dissipated.

That's where York steps in. With York FlakIce Machines giving birth to tons and tons of non-regealing ribbons of FlakIce. They freely circulate throughout the mix . . . providing a quick, uniform temperature reduction.

YORK
FLAKICE
MACHINE
MODEL DER-150

Wherever you find the need for crushed or sized ice, there you'll find York FlakIce Machines . . . from chemical processing to sausage making or concrete cooling in dam construction. For free facts, get in touch with your York Representative or write York Corporation, York, Pennsylvania.

FLAKICE RIBBONS COST LESS COOL QUICKER — SAVE TIME

York FlakIce Machines range in capacity from 1 to 28 tons of ice per day. Stainless steel freezing drum and cutter, automatic "no hands" operation (from flowing water to cascading flakes of ice), assure positive sanitation. Automatic controls and built-in safety features assure high efficiency and trouble-free maintenance.

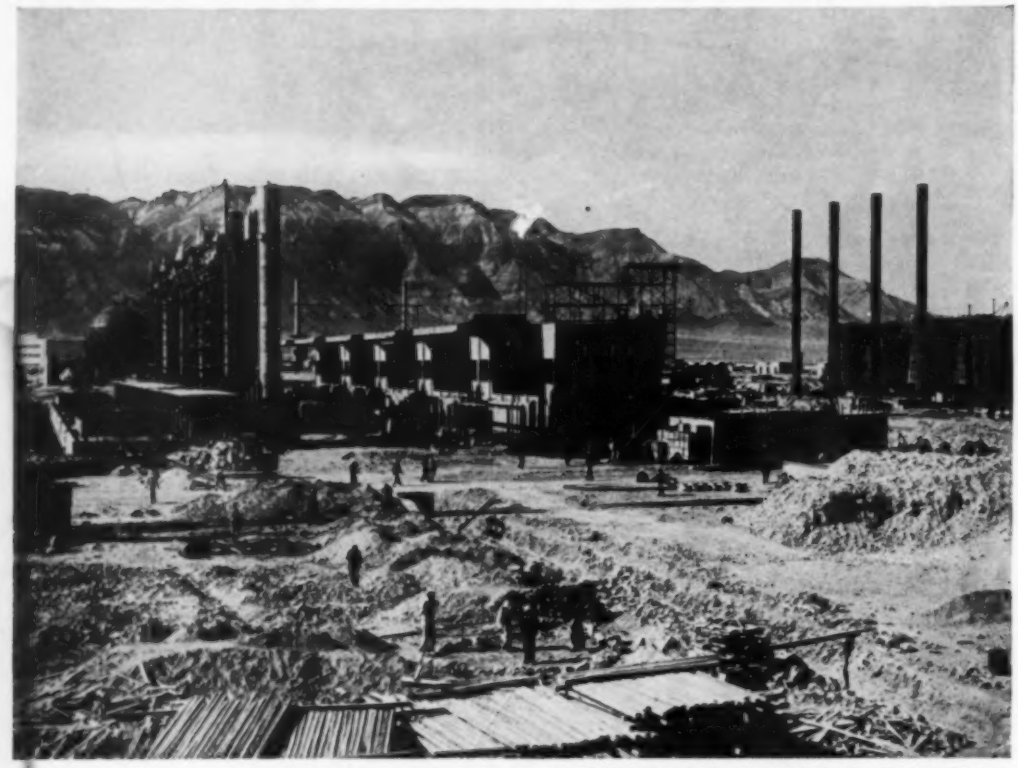
FlakIce Ribbons are superior to cracked or crushed ice. Cost less than bulk ice and eliminate crushing or handling. Fragile brittleness prevents damage to agitator blades or mixing devices. The large ratio of surface to weight of each ribbon gives extra rapid heat reduction of liquids and compounds.

York refrigeration air conditioning

The big advances come from YORK

Headquarters for— **Refrigeration and Air Conditioning**

MORE ABUNDANT HARVESTS FOR *Egypt*



CHEMICO-DESIGNED FERTILIZER PLANT UNDER CONSTRUCTION AT SUEZ, EGYPT.

In the land of the pyramids, thousands upon thousands of Egyptian farmers will reap richer harvests, thanks to the Chemico-built fertilizer works at Suez. This 550-ton-per-day plant and another much larger fertilizer factory, now in the planning stage, will be factors of enormous economic value in increasing the fertility of Egyptian soil. • Other important fertilizer projects are currently being erected in Mexico, India, Japan, the Philippine Islands, the United States and many other countries. These world-wide Chemico activities are the result of wide experience in the design and construction of complete fertilizer plants. Should your plans include the production of commercial fertilizers, it will pay you to consult Chemico.

CC-253

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST

EUROPEAN TECHNICAL REPRESENTATIVE

CYANAMID PRODUCTS, LTD., NORTH WEST WING, BUSH HOUSE ALDWYCH, LONDON W. C. 2, ENGLAND

EUROPEAN LICENSEE OF N. E. C. PROCESS: HYDRO-NITRO S. A., 8 QUAI DU CHEVAL BLANC, GENEVA, SWITZERLAND

CHEMICO

Chemico plants are profitable investments

Did you know?...



ENJAY

*Trade-Mark

sells an extensive line of oxygenated solvents and chemicals

The famous ENJAY* Oval Trade-Mark stands for a diverse line of high-quality solvents and chemicals. Every day more industries are using ENJAY materials to produce improved products.

EXPERIENCED

RELIABLE

DIVERSIFIED

ENJAY markets this wide range of industrial chemicals:

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TYGON

Versus HCl

HYDROCHLORIC acid is as corrosive as it is versatile. Its destruction is as widespread as its application. However, through the correct use of the equally versatile family of TYGON plastic compounds, hydrochloric acid can be held in check—can be used without fear of costly corrosion.

Composed of skillfully modified polyvinyl resins, TYGON — as calendered or press polished sheet; as extruded tubing, solid cord, or channel; as molded goods; or, as a coating — represents the maximum possible in chemical resistance and physical properties. Naturally, the properties of TYGON vary according to the form in which it is used. But in every case, long experience and careful compounding assure the optimum. Proper application is the only needed step to completely satisfactory service with hydrochloric acid or other corrosive chemicals.

As a calendered or pressed polished sheet, TYGON is resistant to hydrochloric acid in any concentration up to 35% by weight and at temperatures as high as 165°-170° F. When subject only to the fumes of the acid, service temperatures can be raised to 200° F. Prolonged contact with mixtures of hydrochloric and other acids is not advised without the previous counsel of U.S. Stoneware engineers. In sheet form, TYGON is used primarily to line tanks, vats, drums, hoppers, bins, fume hoods and fume ducts. Substantial quantities are also cut into gaskets, washers, and diaphragms for use as long lasting, resilient seals or separators in pumps, valves, filters, piping, and a wide variety of process equipment.

As extruded tubing, cord, or channel, TYGON resists hydrochloric acid and its fumes in all industrial concentrations and at temperatures ranging up to 200° F. Lengthy exposure to mixed acids is not recommended without qualified advice.

In extruded form, TYGON has a wide range of application. Most important, however, is its use as flexible tubing and piping in both the plant and laboratory. Long lasting, flexible and transparent, TYGON Tubing is great improvement over glass and other tubing in many complicated lab "set-ups." In the larger sizes, up to 2"ID, the high strength, light weight, and smooth surface of TYGON Tubing qualifies it for use as flexible piping in permanent or temporary acid transfer lines, as gas lines, as syphon hoses, as flexible connections, or as line desurgers. Where constant pressures of more than 40 psi are involved, particularly at elevated temperatures, braided jacket reinforcement is available and suggested.

Extruded cord and channel is generally used as gasketing, but also finds application as expansion jointing and as packing.

As molded goods, TYGON exhibits the same resistance to hydrochloric acid as its extruded form. Pressure and temperature limits vary according to size and design of the piece and the conditions of service, but usually are higher than those for the other forms.

Molded, TYGON takes the form of gaskets, grommets, washers, stoppers, closures, handles, bumpers, and special fittings. Where necessary, it can be reinforced with glass fibers for added strength.

As a coating, TYGON is available as a solvent type paint or as a plastisol. In either form, chemical resistance varies according to the thickness of the coat applied. Special consideration should be given to the limits of a thin film. In general, however, properly applied TYGON PAINT resists the fumes and spillage of hydrochloric acid in any concentration and at temperatures up to 200°F. The thicker coats of the plastisol (Tygoflex) are resistant at as high as 250°F.

As a paint, TYGON is used to protect all types of equipment, structural steel, walls, and ceilings. The number of coats to apply depends upon the conditions of service: a primer plus two topcoats is suggested for mild environments and a primer with no less than five top coats for severe exposures. TYGOFLEX finds use as a heavy duty coating and in the casting or "slush" molding of flexible parts and fittings. In coating work, it is applied by dipping or spraying on hot metal, and then fusing with heat.

TYGON, in any of its forms, is low cost insurance against the attack of not only hydrochloric acid and related chemicals, but a wide range of other acids, alkalies, oils, greases, and water. The different forms available and the range of mechanical, physical, and chemical properties they exhibit, permit the proper use of TYGON in many applications. Versatility and satisfaction in service is further assured by the custom engineering, compounding, and fabricating services available.

TYGON plastics

In addition to TYGON in its various forms, we also manufacture a number of other materials capable of handling hydrochloric acid in any concentration and under all types of operating conditions. These products include chemical stoneware and porcelain, acid proof brick and cements, homogenous lead linings, and other organic linings and coatings.

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Prepared under the editorial direction of Joseph A. O'Connor, News Editor

3M into fluorochemicals

In its new plant near Hastings, Minn., the Minnesota Mining & Manufacturing Co. is now turning out fluorochemicals on a semi-commercial scale by a new process.

Major advantage of the process, an electrochemical one developed for 3M by J. H. Simons of the University of Florida, is that it uses no free fluorine, which is nasty and dangerous to work with. Instead, it uses hydrogen fluoride.

Another advantage is that it is a single-step process and potentially less expensive than other processes. This move puts Minnesota Mining in the forefront in the fast growing field of new and versatile fluorocarbons.

Wilson reports on chemicals

Of the $665 million in new facilities for the production of chemicals that had been certified for fast tax writeoffs up to the middle of this year, $155.5 million, or almost one-fourth of the total, is now in place. That's the report Director of Defense Mobilization Charles E. Wilson was able to give President Truman at the beginning of October.

Most rapid expansion has been in facilities for inorganic industrial chemicals, for which 43 percent of a certified investment of $148 million is in place.

Construction of new chlorine and ammonia plants particularly is being rushed to meet growing military requirements and the need for fertilizer to increase agricultural output.

Biggest problem in the chemical industry, Wilson reports, continues to be getting enough of certain basic chemicals such as benzene and sulphur. The critical chemicals made from them will be in better supply when programs for expanding sources of such basic materials are further along.

Impact of climbing chemical production

Effect of the tremendous expansion under way in the chemical industry is beginning to be felt. U.S. production of a wide variety of chemicals during the first half of this year has far surpassed the output during the first six months of 1950, reports the National Production Authority, which has just completed a survey covering 68 important chemicals. A few chemicals jumped 100 percent or more, while many rose 20 to 50 percent.

Biggest increase was racked up by acetanilide, used in the manufacture of sulfa drugs, sedatives and other products. Its production rose from 1,358,000 lb. in the first six months of 1950 to 3,670,000 lb. in the first half of this year, for an increase of 170 percent.

Benzene hexachloride, an insecticide, increased 118 percent, while production of finished light soda ash was up 112 percent and the production of pyridoxine, which is vitamin B_6, jumped 100 percent.

Substantial gains were made in many highly essential chemicals. Production of styrene, needed for synthetic rubber and plastics, was 38 percent greater in the first half of 1951 than in the comparable period of 1950. Total U.S. styrene output from both government and private plants rose from 234,854,000 lb. to 323,322,000 lb.

Output of DDT was 58 percent greater and the production of 2,4-D, a weed killer, was up 62 percent.

Production of carbon tetrachloride, which has uses ranging from production of Freon gas for refrigerants and aerosol solutions to industrial applications as a solvent and in fumigants and insecticides, increased 22 percent.

Total production of benzene rose from 77,589,000 gal. to 89,861,000 gal. Manufacture of motor grade benzene dropped 27 percent, but production of 1 deg. benzene increased 18 percent and 2 deg. was up 17 percent. Significantly, output of other industrial benzene climbed 55 percent.

In the first half of 1951 a total of 1,200,245 tons of chlorine was produced. This was a gain of 21 percent. Monochlorobenzene output increased 39 percent.

Phenol, another workhorse chemical, was produced at a rate 27 percent greater in the first half of this year than in the corresponding period of 1950. It went from 142,752,000 lb. to 180,730,000 lb.

Manufacture of phthalic anhydride increased 22 percent. It's in demand by makers of alkyds among others.

Synthetic anhydrous ammonia production increased 13 percent, from 1,519,280,000 lb. to 1,712,447,000 lb. But ammonia liquor, on the basis of its NH_3 content, declined 29 percent. Fertilizer grade ammonium nitrate rose 6 percent and all other grades showed a gain of 16 percent.

Industrial ethanol was up 35 percent. Production of synthetic methanol climbed 49 percent, and formaldehyde was up 41 percent.

Despite the sulphur shortage, the chemical industry was able to squeeze out 8 percent more sulphuric

acid in the first six months of this year than it did in the same period of last year. Total output of sulphuric edged up from 6,259,783 tons to 6,739,212 tons.

Expansion is still under way, and production of many chemicals will be even greater in 1952. Even so, rapidly mounting demand for chemicals has more than kept pace with increasing production in most instances, NPA says.

Dixie: a coming chemical center

Chemical industry plans to locate more than half of its proposed new plants in the South, according to Dr. Frank J. Soday, research director of Chemstrand Corp., who predicts that a fourfold growth of the synthetic textiles industry will spearhead expansion of southern chemical industry.

Pointing out that about 145 million pounds of synthetic fibers was produced in the U.S. in 1950, Soday says that production is expected to increase to 400 million pounds in 1953, to 500 million pounds in 1958, and to 750 million pounds in 1960.

The South, he thinks, will get most of this new industry. It has the plant sites, the labor, an abundance of water, transportation facilities, raw materials, fuel and power, and access to large and important consumer areas.

His own company, for example, is building a plant at Decatur, Ala., to produce 30 million pounds per year of its new staple fiber Acrilan, and a second plant at Pensacola, Fla., for the production of 50 million pounds per year of nylon. Chemstrand will invest more than $100 million in these two plants alone. And other makers of synthetic fibers are invading the South.

Soday predicts that the South's synthetic fiber boom will be as striking as its recent progress in cotton textile activity. At the turn of the century, more than 70 percent of the nation's cotton spindles were in New England; today, 75 percent are in the South.

Since the new synthetic fiber industry is the offspring of the chemical and textile industries, "it was inevitable," says Dr. Soday, "that it would be located in the South." Dixie's new chemical plants will provide the required raw materials for synthetic fibers, while the South's textile mills will convert these fibers into fabrics for consumer markets.

New producer of chemical pulp from wood

Long a big producer of chemical pulp from cotton linters, Procter & Gamble is now moving into the manufacture of dissolving pulp from wood. P&G's subsidiary, Buckeye Cellulose Corp., has purchased 465,000 acres of pine woods near Foley, Fla., at a price probably exceeding $5 million. DPA has granted a fast tax writeoff of 65 percent on the dissolving pulp plant soon to be built there.

When production from cotton linters couldn't keep pace with climbing demand for chemical pulp, P&G decided to start making it from wood. Even though P&G crushed 10 percent of all cottonseed crushed in the U.S. in 1950, it had a hard time keeping its Memphis, Tenn., pulp plant supplied with linters. The same has been true this year. Hence the decision to start making pulp from pine, thus freeing production from total dependence on the size of the cotton crop.

This new venture will cost P&G about $35 million. It's planned to finance the building of the new plant to make dissolving pulp from wood by a 10-year loan.

Cobalt refining hubbub

NEW PROCESS—Cobalt refining processes are currently of crucial importance (see *Chementator*, Sept. 1951, p. 112). At least two new cobalt refineries will be operating in the U.S. within a year or two. Another is contemplated. A big project under way in Canada will also recover cobalt by a new refining process. This process itself is one you are going to hear more and more about. For one thing, it produces metals in a form of interest to powder metallurgists. What's more, it may be usable in the refining of other metals akin to cobalt. And it may have other applications. Right now, it's very hush-hush, as are certain uses of cobalt.

CANADIAN VENTURE—Up in Canada, Sherritt-Gordon Mines, Ltd., has under way a vast mining and refining project that will cost upwards of $35 million, exclusive of working capital and contingencies. At Lynn Lake, Manitoba, Sherritt-Gordon has 14 million tons of proved ore, rich in nickel, copper and cobalt, mostly as sulphides.

To exploit this big deposit, Sherritt-Gordon persuaded Canadian National Railways to push through a 147-mi. railroad from Sherridon, Manitoba, to the mine at Lynn Lake. To get the power it will need initially at the mine and mill, Sherritt-Gordon completed two storage dams to control the Laurie River at its sources, will divert a neighboring stream into the Laurie, and erect a 7,000-hp. hydroelectric dam downstream. Three other damsites (one at 7,000 hp. and two at 2,000 hp.) have been picked for possible future development. By the end of 1953, Sherritt-Gordon expects the railroad and power plant to be completed and the mine and mill ready for the start of production.

MILLING—At the Lynn Lake mill, ore will be separated into a copper concentrate and a nickel-cobalt concentrate by selective flotation. These concentrates will be shipped to the refinery.

AMMONIA LEACHING—At the refinery, no roasting will be required. A new ammonia leaching process will be used. It was worked out jointly by Sherritt-Gordon and Chemical Construction Corp. in a pilot plant at Ottawa. Not much can be said about it, but

(*Continued on page 110*)

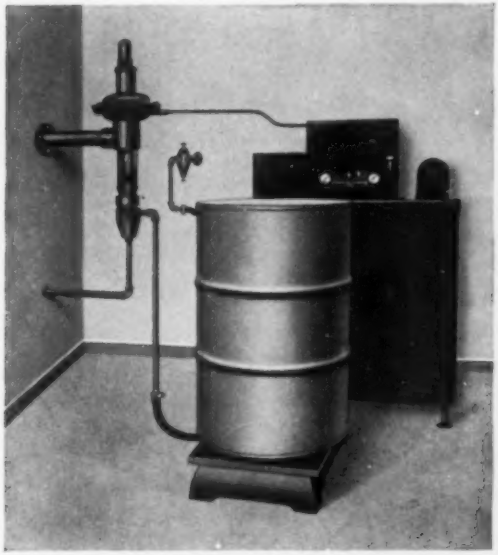
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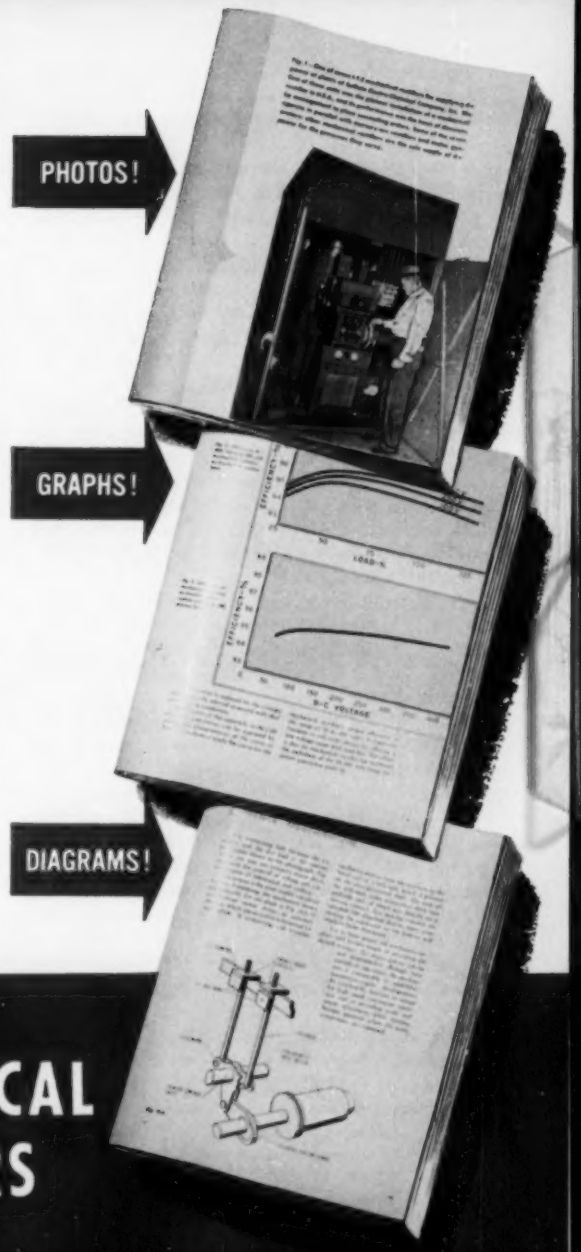
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MECHANICAL RECTIFIERS

basically the process consists of simultaneous oxidation and ammonia leaching of the green concentrates to produce soluble nickel, copper and cobalt compounds.

Through use of small amounts of sulphuric acid and a reducing agent in the following stages, nickel and cobalt are recovered as powdered metals. Ammonium sulphate is a valuable byproduct.

The refinery will be built at Edmonton, Alberta, near natural gas for making ammonia. It will include its own ammonia plant.

Advantages of the ammonia leaching process are: (1) low operating cost; (2) high recovery of pure cobalt; and (3) a 75 percent recovery of sulphur as ammonium sulphate.

OUTPUT—By 1955, Sherritt-Gordon expects to be turning out 8,500 tons a year of nickel, 4,000 tons of copper and 300,000 lb. of cobalt. Nor would it be surprising if almost double that amount of cobalt were produced thereafter. In addition, the refinery will produce 70,000 tons of ammonium sulphate yearly.

U. S. REFINERIES—Ammonia leaching will also be used in the new cobalt, nickel and copper separation plant that National Lead will build at Fredericktown, Mo., as part of a $5 million expansion called for by the Defense Materials Procurement Agency. The government will finance acquisition of new equipment.

The complex lead-copper-nickel-cobalt ore at Fredericktown will be separated by flotation into a lead concentrate, a copper concentrate and a nickel-cobalt concentrate. The flotation concentrates will be treated by the new process worked out by Sherritt-Gordon and Chemico.

DMPA will purchase all metal contained in concentrates or all concentrates produced by the new facilities. The government will pay $1.845 per lb. for cobalt, 47.4 c. per lb. for nickel and 21.4 c. for copper, f.o.b. cars, Fredericktown.

National Lead expects to have its new plant operating within 18 months. It will produce the three metals at an average annual rate of 1,417,500 lb. of copper, 1,852,200 lb. of nickel and 1,386,000 lb. of cobalt.

ACID LEACHING—At Garfield, Utah, the other new U. S. refinery, now being built by Howe Sound Co., will use an acid leaching process. This process, developed by Chemical Construction, is a high-temperature high-pressure one that requires special autoclaves made of titanium.

Cobalt concentrate will come to Garfield from the mill of Calera Mining Co. at the Blackbird mine near Forney, Idaho. Calera is a subsidiary of Howe Sound. When it gets going, perhaps by late 1952, the Garfield refinery is slated to turn out 3.3 million pounds a year of cobalt.

STILL ANOTHER—Continental Ore Corp. and Tennessee Products & Chemical Corp. have teamed up and are at work on a cobalt refining process of their own in a pilot plant at Chattanooga, Tenn. Dr. Walter Voos, formerly of the Letmathe cobalt refinery at Letmathe in Westphalia, one of the largest in Germany, is at work in the Chattanooga pilot plant on modifications and improvements of the German methods. It's conceivable that, if a process can be worked out, a refinery might be built in the South to handle imported ores or concentrates.

First pulp mill for Alaska

Construction of a $45 million pulp mill near Ketchikan, Alaska, will start next spring. The mill, Alaska's first, will be a joint venture of Puget Sound Pulp & Timber Co. and American Viscose Corp. It's slated to go into production in about three years.

At the outset, the mill will have a capacity of 300 tons a day. But under terms of its agreement with the U. S. Forest Service, the Ketchikan Pulp & Paper Co., which will operate the mill, has five years more to boost output to 500 tons if it wants to.

Ammonium phosphate plant for Canada

Work has been started by Stone & Webster Canada, Ltd., on the new $9 million fertilizer plant of Consolidated Mining & Smelting Co. at Kimberley, B. C.

Byproducts from the nearby Sullivan concentrator will be used in the fertilizer plant, which will produce 70,000 tons of ammonium phosphate annually.

Operation will require roasters, a gas cleaning plant, sulphuric acid unit, phosphoric acid unit and phosphate fertilizer plant. Completion of the new plant is scheduled for early 1953.

Report card on ammonia pulping

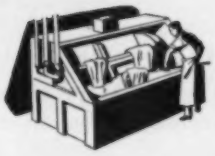
At its Lebanon, Ore., mill Crown Zellerbach Corp., in cooperation with Soundview Pulp Co., has completed two important steps in its program to minimize stream pollution by sulphite waste. So far, Crown Zellerbach has: (1) replaced dolomite base by ammonia base in its sulphite pulping process; and (2) put into operation a pilot plant for the evaporation and burning of waste liquor from the ammonia process.

Here's what L. A. La Fond, superintendent at Lebanon, and W. F. Holzer of the research staff have to report on the switchover: "The conversion required very little change in equipment and has resulted in greater pulp production capacity, milder cooking conditions, better quality pulp except for color, reduced screening, better pulp yield, generally improved operating conditions and savings in operating chemicals and maintenance.

"Against these advantages has been the cost of ammonia and the increased slime growth. The first is more than offset by direct savings and the second has been controlled by use of organic mercurial slimicides. The benefits from the use of ammonia are attributed

(*Continued on page 112*)

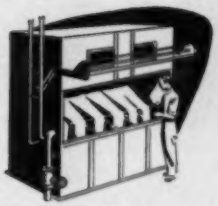
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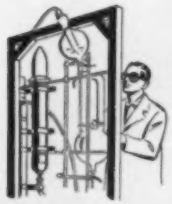


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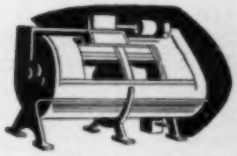
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to its ease of handling, its solubility, and the rapid penetration of wood as the base of cooking acid."

In sum, here are the results of substituting ammonia for dolomite base over an operating period of one year: yield of screened pulp from wood, up 6 percent; screenings, down 60 percent; sulphur consumption, decreased 40 lb. per ton; ammonia consumption 85 lb. per ton, compared with 200 lb. per ton for dolomite consumption; steam consumption, decreased 200 lb. per ton; and cooking cycle, reduced about 12 percent.

Belgian process for West Coast glycol plant

Hancock Oil Co. will use a Belgian process to produce ethylene glycol in the new $4 million plant that it starts building next month at Long Beach, Calif. Hancock got the process from Societe Carbochimique of Belgium through a licensing arrangement.

The Belgian process will have to be modified, however, since Hancock plans to operate some equipment outdoors. The entire process was carried on indoors at the Belgian plant. The new Hancock glycol plant, first on the West Coast, will also produce ethanolamines.

Meantime, Hancock is also expanding its sulphur recovery capacity from 80 to 120 tons. Addition of another catalyst chamber will be completed by February. Built at a cost of $250,000, it will make possible higher flow rates and greater recovery of sulphur.

Pennsalt and Sharples to join forces

By an exchange of Pennsalt common stock for Sharples common, these two companies will be combined, probably late in December. Pennsalt, long engaged in the manufacture of inorganic chemicals, has in recent years been moving steadily into organics. Sharples specializes in synthetic organics.

Principal raw materials required for the Sharples products are chlorine, caustic soda and ammonia, which for many years have been purchased from Pennsalt by Sharples. It was to get these Pennsalt products that Sharples in 1932 located next to Pennsalt's Wyandotte, Mich., plant.

Industries served by Sharples are generally different from those served by Pennsalt. Principal products of Sharples are rubber chemicals, solvents for paint and lacquer manufacturing, intermediates for pharmaceuticals, and similar products.

Pennsalt common stock will be offered at the rate of 5.15 shares for each share of Sharples common. Pennsalt plans to issue up to 88,497 additional shares of common in exchange for all outstanding Sharples common stock. If all outstanding Sharples common is exchanged, Pennsalt's common stock outstanding will increase from 999,035 to 1,087,532.

Concentrated sulphuric from sludge acid

Sludge acid from neighboring refineries will be converted into concentrated sulphuric acid in a new $3.5 million plant at Baton Rouge, La., to be build by Chemical Construction Corp. for Consolidated Chemical Industries. Much of the spent acid will come from the nearby Esso refinery.

At the Consolidated plant, carbon will be burned out of the sludge acid in regenerating units, then the acid will be refortified to produce water-white concentrated sulphuric such as is used in the manufacture of high-octane gas and alcohol. When completed next year, the plant will produce 400 tons of acid daily.

New wet bottom precipitators for paper mill

Two wet bottom electrostatic precipitators will be installed by Research Corp. at the Port St. Joe, Fla., plant of the St. Joe Paper Co. They will handle gases from two new spray type recovery furnaces, each designed to handle 138,000 cfm. at 275-300 deg. F.

The precipitators will have a collection efficiency of 93 percent for the recovery of sodium salts from waste material.

Instead of collecting dust in hoppers at the bottom of each precipitator and conveying it, in the dry state, to black liquor tanks, these new wet bottom units utilize a liquor sump or tank directly under the Cottrell precipitator. The sump or tank is an integral part of the precipitator. Black liquor flows to this wet bottom, where the recovered dust is taken up in solution or suspension. During this continuous process, black liquor discharges to the feed going to the disk evaporators.

The wet recovery system does away with all handling of dry dust. It eliminates steam coils and heat insulation formerly needed to prevent condensation in the hoppers, and makes such equipment as hopper vibrators and steam jacketed conveyors unnecessary.

Another market for amino products

A pair of amino products made by International Minerals & Chemical Corp. may have a promising future in pharmaceuticals. The two are betaine and glycocyamine, both derivatives of glycine. They seem to have a helpful action on muscles damaged by disease.

These products combine in the body to give phosphocreatine. This may be the clue to their effectiveness. A normal constituent of muscle, phosphocreatine results from the combination of creatine and phosphoric acid.

Hints of this development could have been one reason for the recent speculative flurry in International's stock, which sent it to a then high for the year of 44⅞, from which it later receded into the high 30's. Low for the year had been 25¼. At any rate, International is putting increasing emphasis on pharmaceutical markets for its amino products. —*End*

POSITIVE, LOW COST CONTROL OF INDUSTRIAL WASTES...

Effective, positive treatment for phenol, cyanide and other noxious industrial wastes—without excessive installation and operating costs—is now available through the Mathieson Chlorine Dioxide Process. Existing installations, handling both large and small waste volumes, attest to the efficiency and economy of this treating method.

Mathieson's Chlorine Dioxide Process



* Low Capital Investment

A Chlorine Dioxide system to handle an average waste output can be installed for $2000-$3000, and amortization charges are negligible. The equipment consists only of a small holding tank, a chlorine dioxide solution generator and the metering equipment for the chlorine and sodium chlorite solutions.

* Simple Installation

The Chlorine Dioxide system, being extremely compact, can be quickly and easily fitted into the disposal facilities. No special housing is necessary to contain the equipment.

* Minimum Maintenance

The simplicity of the Mathieson Chlorine Dioxide equipment minimizes maintenance and no special technical supervision is required for operation. The chlorine dioxide is fed automatically at the predetermined rate for safe, positive control.

Mathieson's background of experience, accumulated over many years in the field of sanitation is available to you. Write for information about the Chlorine Dioxide Process. Mathieson Chemical Corporation, Baltimore 3, Maryland.

Mathieson CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH



You will find *ideas in action* when you visit the Bailey Meter Exhibit, in Booth 56, at the 1951 Exposition of Chemical Industries.

For your process and power plant planning in '52 you will want the latest in measurement and control instruments. At the Bailey Exhibit you will see ways to use fuel at high efficiency—measure small rates of flow, simplify temperature measuring installations, reduce telemetering problems, brighten up plant appearance—and operate with a maximum of safety.

Your metering and control problems will be welcomed and held in the strictest confidence—come in and talk it over, or ask for a Bailey Engineer to call at your plant. G-32

These ideas for '52 will simplify and improve your process or power plant operation:

MINI-LINE Equipment—
An operating Control Console, a Model Control Room, and an Application Diagram show how you may use miniature indicators and controls to: concentrate control stations; use available manpower to best advantage; and minimize control room space requirements.

ARMORTUBE—
A flexible protected multi-tube cable which will cut your overall construction costs and improve the appearance of your pneumatic telemetering and control systems.

Characterized Positioning Relay—
A compact unit to improve performance of Control Valves and Control Drives.

Area Type Fluid Meter—
Process liquids at low rates of flow are accurately measured by this sensitive telemeter transmitter.

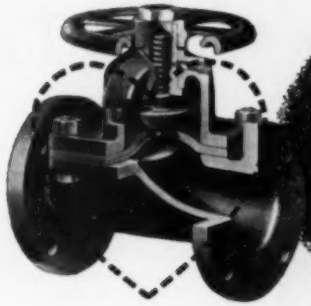
BAILEY METER COMPANY

1054 IVANHOE ROAD • • • CLEVELAND 10, OHIO

Controls for Processing

TEMPERATURE FLOW
PRESSURE LEVEL
% OXYGEN DENSITY
% COMBUSTIBLES RATIO

for the heart of the Saunders Patent Valve . . .



Hills-McCanna offers a complete selection of diaphragm materials to best suit your individual requirements

Code Number	Base	Stock Type	Service Quality
R-1	Rubber	Carbon Black	Acid/Alkaline, Heat Resistant
R-2	Rubber	Non-Carbon Black	High Acid/Alkaline Resistant
R-3	Rubber	Carbon Black	Non-Fat Food Service
R-4	Rubber	Carbon Black	Special Non-Contaminating
R-5	Rubber	Non-Carbon Black	Acid/Alkaline, Abrasion Resistant
N-1	Neoprene	Carbon Black	Acid/Alkaline/Oil/Heat Resistant
N-2	Neoprene	Carbon Black	Fat Food Service, Non-Contaminating
N-3	Neoprene	White	Special Non-Contaminating
H-1	Hycar	Carbon Black	Acid/Oil/Heat Resistant
K-1	Butyl	Carbon Black	Acid/Heat Resistant
T-1	Tygon	Carbon Black	Acid Resistant
C-3	Compar	Carbon Black	Solvent Resistant
L-1	Special Polyethylene	White	Acid Resistant (66° Be Sulfuric)
M-1-25	Kel-F	Non-Carbon Black	High Acid/Alkaline Resistant

In over 15 years of supplying Saunders Patent Diaphragm Valves to the processing industries, we have developed an extensive background of experience in the recommendation of the proper diaphragm material to meet a given set of conditions. This experience proves that only with diaphragms especially selected for your needs can you get the *best* service from your diaphragm valves. The wide range of diaphragm materials and their basic characteristics are shown in the table above. Each of these has advantages and limitations—no one is a cure-all—and the secret of successful selection of the right diaphragm is a thorough knowledge of these advantages and limitations.

Here at Hills-McCanna, recorded in the service records, is the experience that has resulted from valving over 2500 substances. This data is constantly being brought up to date to take into consideration the development of new diaphragm materials such as polyethylene and Kel-F. To any user of Hills-McCanna Valves, this record assures you of having the knowledge gained from thousands of other installations working for you.

Whatever your valving requirements, if they involve handling corrosive substances, slurries, semi-solids or other hard-to-handle fluids, we would welcome the opportunity to go over your needs with you. Hills-McCanna Diaphragm Valves are available in sizes from ⅜" to 14" handwheel or lever operated or arranged for automatic or remote operation. Choice of 14 diaphragm materials, 48 body materials. Write for descriptive literature. HILLS-McCANNA CO., 2341 N. Western Ave., Chicago 18, Illinois.

HILLS-McCANNA

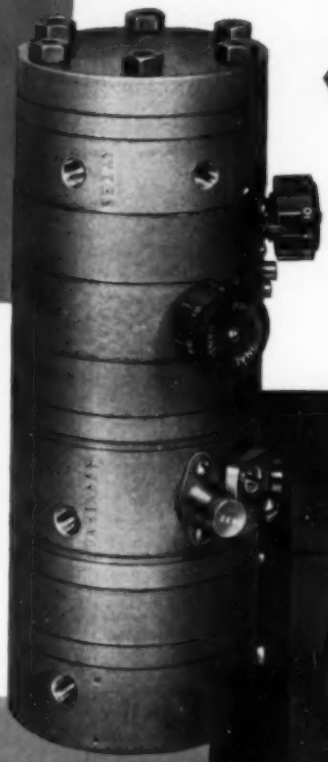
saunders patent

diaphragm valves

Also manufacturers of Proportioning Pumps
Force Feed Lubricators • Magnesium Alloy Castings

Important





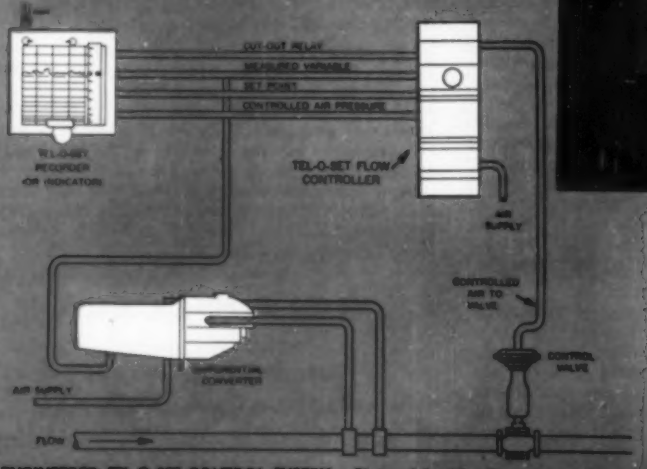
TEL-O-SET CONTROLLER

Available in adjustable and fixed proportional band models, and with three control forms . . . for flow, temperature, pressure, level and other process variables. Universal bracket permits optimum flexibility in mounting . . . coded, interchangeable sections and split manifold contribute to simplified maintenance. Write for Specification Sheet No. 768.

TEL-O-SET RECORDER

Features withdrawal of chassis for full 8-hour chart visibility without interrupting operations, bumpless shifting from automatic to manual operation, all adjustments from front of panel, built-in adjustable restrictions for pulsating flow . . . requires panel space just 5¹⁄₁₆" high by 5" wide. Write for Specification Sheet No. 769.





TYPICAL ENGINEERED TEL-O-SET CONTROL SYSTEM—Pictured in this diagram are the elements of the *Tel-O-Set* Family, designed and built as an integrated loop. Here the system is applied to the control of flow with the Differential Converter used as transmitter.

TEL-O-SET INDICATOR

Can be used with any pneumatic transmitter, having a 3-15 psi controlled air output, regardless of the primary element being used. Provides indication of process variable, set-point of controller or controlled air pressure to valve when on automatic control . . . is easily shifted to manual operation. Panel cut-out size same as recorder. Write for Specification Sheet No. 770.

Contribution to Process Control

. . . THE HONEYWELL TEL-O-SET FAMILY



THIS pace-setting pneumatic control system is ready for application to a host of processes demanding a new high in speed, precision and accuracy . . . for almost any process variable. Developed as part of a family relationship, each unit complements the others in producing a system of superior performance.

Used with any one of a group of Honeywell measuring elements . . . for flow, temperature, pressure, liquid level, etc. . . . the *Tel-O-Set* system is destined to make important contributions to the improvement of process control throughout industry.

For more detailed information, send for the literature mentioned in the descriptions at left . . . or call in our local engineering representative for a discussion of your process control problems.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**

Brown Instruments

Nash Instrument Air Compressors deliver only clean air, free from oil or dust, and without filters



Here is Why!

You can dispense with oil filters and dust filters when you install ®Nash® Clean Air Compressors. You can save the cost of maintaining these devices. You can greatly reduce instrument maintenance costs. For the Nash employs no internal lubrication, therefore no troublesome oil is in the delivered air. Moreover, air from a Nash is thoroughly washed and cooled as it passes thru the pump. Dust in the plant atmosphere, even fly ash, is immediately removed.

®Nash® Clean Air Compressors are simple, with only one moving element. No valves, gears, pistons, sliding vanes, or other enemies of long life and constant performance complicate a Nash. No aftercoolers are needed. You will find it profitable to investigate these pumps, now.

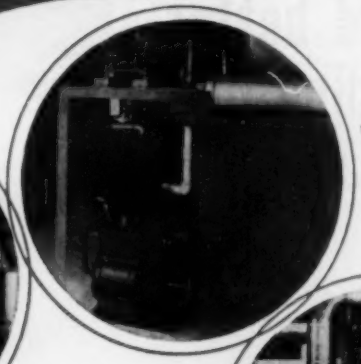
- No oil filters.
- No dust filters.
- No internal lubrication to contaminate air handled.
- No internal wearing parts.
- No valves, pistons, or vanes.
- Non-pulsating pressure.
- Original performance constant over a long pump life.
- Low maintenance cost.

NASH ENGINEERING COMPANY
397 WILSON, SO. NORWALK, CONN.

Seen in the Best Circles!



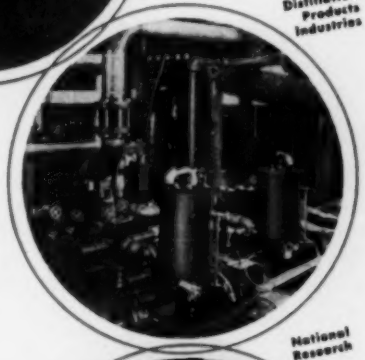
Sylvania Electric Products



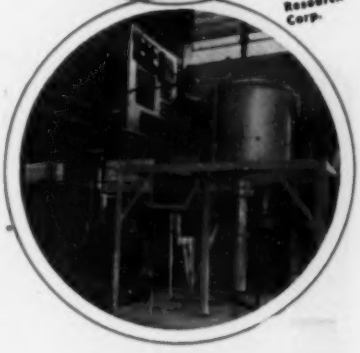
Proctor & Schwartz



Climax Molybdenum



Distillation Products Industries



National Research Corp.

- **Sylvania Electric Products is producing super-size TV picture tubes in this giant merry-go-round.**
- **Climax Molybdenum uses this high vacuum furnace for metallurgical research.**
- **Proctor & Schwartz and Dry-Freeze Corporation have developed a process for freeze-drying materials which would otherwise be damaged by high temperatures.**
- **Putting a thin layer of metal on cellophane is the job of this vacuum coating machine made by Distillation Products Industries.**
- **Metals are melted and cast to a new high standard of quality in this National Research Corporation vacuum furnace.**

Each of these installations is different: each is designed to perform a highly specialized task. But all have this in common — all use KINNEY HIGH VACUUM PUMPS to get down to low absolute pressures fast and dependably.

For your vacuum needs, be sure to get a KINNEY, the pump that's seen in the best of circles. Send for new Bulletin V-51B. KINNEY MANUFACTURING CO., 3551 Washington St., Boston 30, Mass. Representatives in New York, Chicago, Cleveland, Houston, New Orleans, Philadelphia, Los Angeles, San Francisco, Seattle.



SEND FOR THIS NEW BULLETIN V-51B

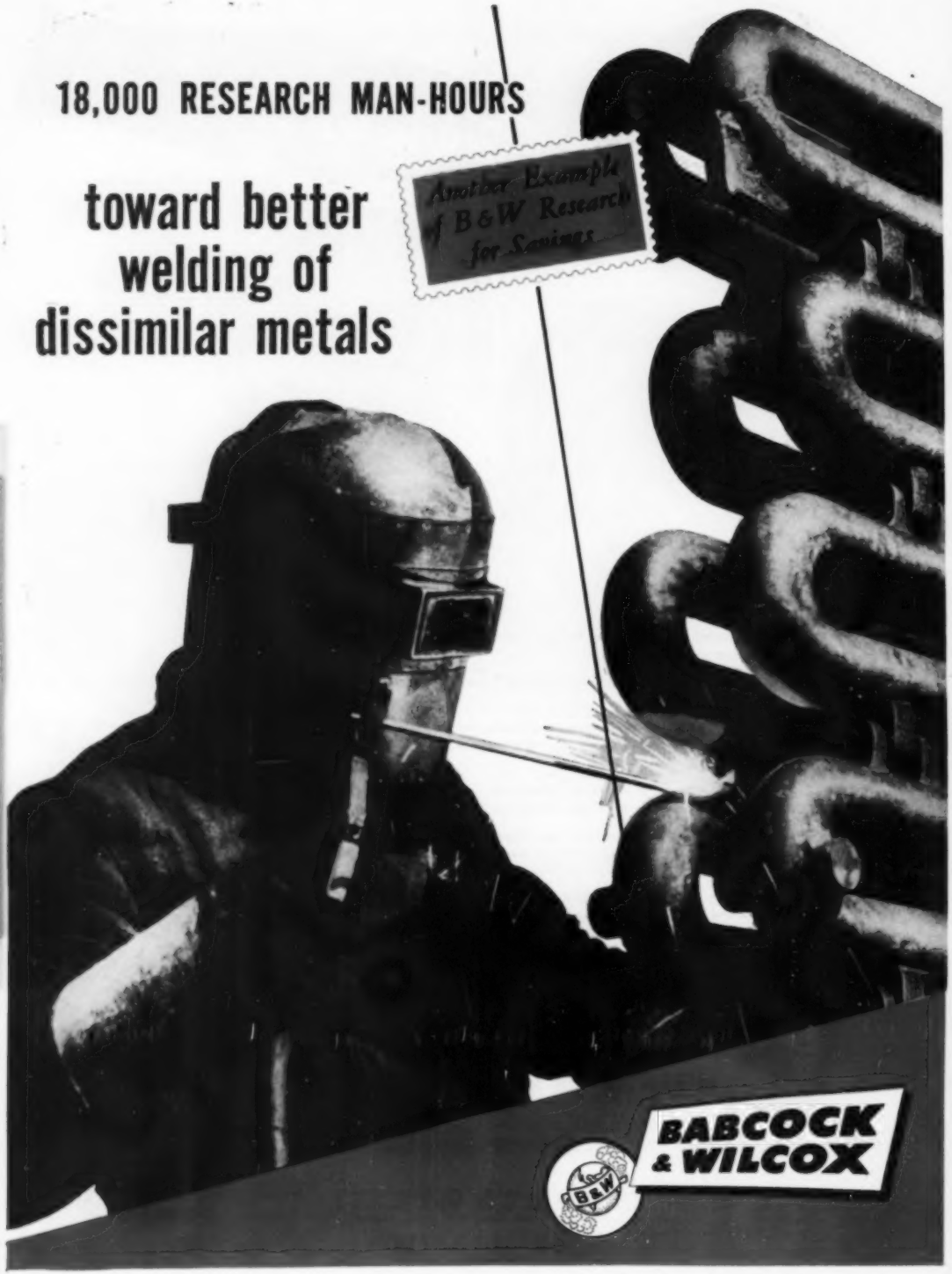
Kinney VACUUM PUMPS

FOREIGN REPRESENTATIVES: Gen'l Engineering Co., Ltd., Radcliffe, Lancs., England • Horrocks, Roxburgh Pty., Ltd., Melbourne, C. I. Australia • W. S. Thomas & Taylor Pty., Ltd., Johannesburg, South Africa • Novelectric, Ltd., Zurich, Switzerland • C.I.R.E. Piazza Cavour 25, Rome, Italy.

18,000 RESEARCH MAN-HOURS

toward better welding of dissimilar metals

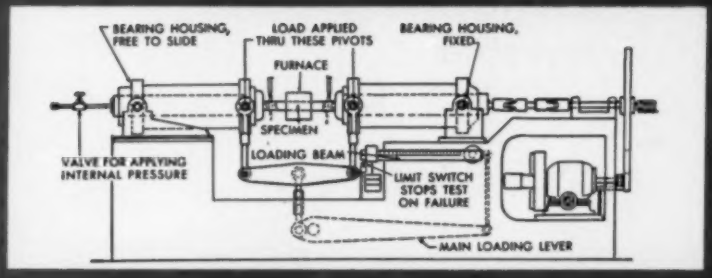
Another Example of B&W Research for Savings



BABCOCK & WILCOX

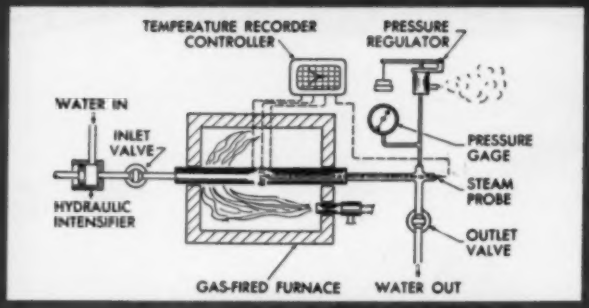
ROTATING BEAM FATIGUE MACHINE

Designed and built by B&W, this apparatus is used to observe fatigue of transition welds between tubular specimens of dissimilar metals under simulated high pressure, high temperature operating conditions.



CYCLIC QUENCH APPARATUS

Also designed and built by B&W, this test is used to determine the effects of repeated quenching on transition welds between tubular specimens of dissimilar metals, at elevated pressures and temperatures.



STEEL assumes many forms to meet the increasingly severe conditions of modern processing temperatures, pressures, and stepped-up cycles of operation. The use of several different steel analyses together may be necessary to obtain optimum dependability, service life, and economy in vessels and heat-transfer units.

THESE STEELS, individually, and under conditions each must meet—are stable, tough, flexible, and strong. However, when welded together, they tend to become intractable . . . creep, flow, stretch, warp, harden, crack, and otherwise change at the welded joints to a dangerous and costly degree. B&W is constantly seeking improved methods of welding—to curb these capricious traits of modern alloys.

FOR EXAMPLE: B&W is continuing a four-year-old project, involving over 18,000 research man-hours, on joining widely dissimilar alloys in tubular form. Findings have already produced new methods of control and new welding techniques that are measurably superior to any used before.

THIS SORT OF CREATIVE RESEARCH approach to problems of fabrication is characteristic of the many plus values that distinguish all B&W-built process equipment.

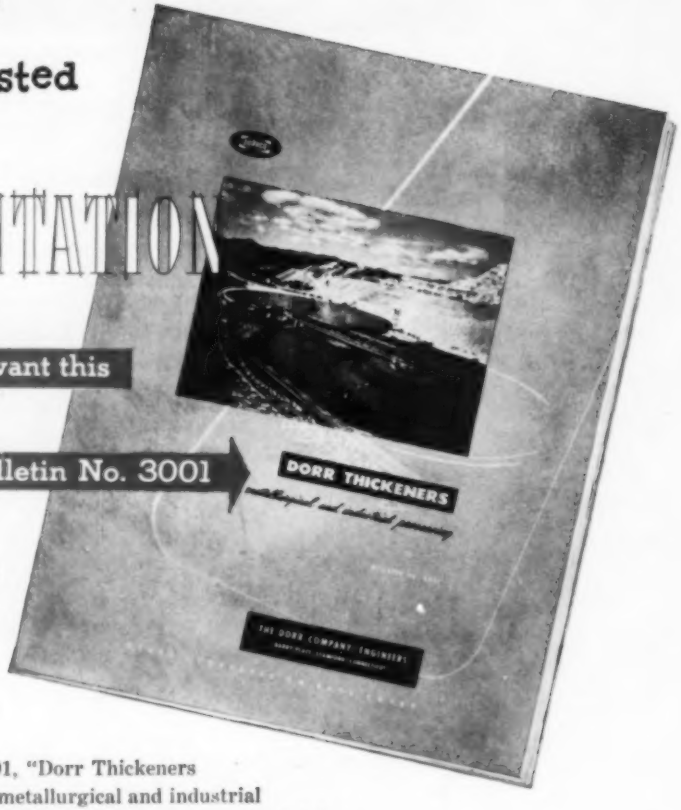
S-408T

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SEDIMENTATION

you'll want this

new bulletin No. 3001





Bulletin #3001, "Dorr Thickeners for chemical, metallurgical and industrial processing" has just come off the press. Containing 28 pages of descriptions, drawings and photographs, it covers the comprehensive line of Dorr Thickeners briefly and factually. If you're concerned with thickening problems and the equipment with which to solve them, you'll find it helpful. Write for your free copy today.



We'd like to show you some of our newest developments at the 23rd Exposition of Chemical Industries at Grand Central Palace in New York, November 26 to December 1. We'll be glad to see you at Booths 64 and 65 on the main floor, any time during the Show.

DORR

WORLD-WIDE RESEARCH · ENGINEERING · EQUIPMENT

THE DORR COMPANY · ENGINEERS · STAMFORD, CONN.

Offices, Associated Companies or Representatives in the principal cities of the world

Multi-Purpose Thermostat solves problem in Fuller Brush assembly—prevents damage to machinery, motor



INVERSE CARTRIDGE THERMOSWITCH UNIT #17001 which closes on temperature rise is inserted in well inside of pitch tank and connected in series to starting switch and magnetic contactors. Machinery operates only when pitch has reached the preset temperature that assures fluidity. It then moves through automatically operated spout (a) into hollow brush handle (b).

When vegetable brushes are assembled at the Fuller Brush plant, a pitch-like sealing compound is poured into the hollow handle of the brush. The brush is then inserted in the handle and completed brush moved on to packing room.

Trouble-point in this procedure was the sealing compound. If it were not heated to a fluid state before machinery was started, automatic spout was broken and motor burned out.

A low-cost Fenwal THERMOSWITCH Unit averted this stoppage by continually, *accurately* controlling the operation of the motor. Electric motor cannot now start until the compound has reached the desired temperature. Thus damage to machinery as well as motor is prevented.

Easy-to-install, easy-to-maintain Fenwal THERMOSWITCH thermostats solve all types of control problems in industry. Their activating control element is the single-metal shell that expands or contracts *instantaneously* with temperature changes, making or breaking the totally enclosed electrical contacts. It is this unique principle that enables THERMOSWITCH Units to effectively control *many* variables where heat is a factor.

Mail the coupon today and find out how Fenwal THERMOSWITCH Controls can help you in your own processing.

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THERMOSWITCH®

The Precision, Multi-Purpose, Thermostat Control

SENSITIVE...*but only to heat*

Visit our Booth 603



FREE!

Get this bulletin . . . see what Fenwal THERMOSWITCH Units can do for you. *Just fill in coupon and mail ...no obligation.*

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TEMPERATURE CONTROL ENGINEERS

Name.....Position.....

Company.....

Street.....

City.....Zone....State.....

I am chiefly interested in the applications checked:

- ☐ Heating
- ☐ Cooling
- ☐ Alarm (over-temperature, under-temperature)
- ☐ Timing (thermal)
- ☐ Humidity Control or Detection
- ☐ Vapor Level Control
- ☐ Pressure Control (by controlling vapor temperature)
- ☐ Radiant Heat Control

OTHER (Please fill in your special requirements)

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HNO_3
NH_4OH
$NaCl$
H_2O
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HEAVY STEEL PLATE
BONDERIZED SURFACE
FORMALDEHYDE-ALHYD-TYPE ENAMEL
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THERMOSET VARNISH
FINAL COAT OF GRAY LACQUER

FIVE PLUS BANDS OF PROTECTION

make this the longest-lived chemical motor

You get more protection against corrosive materials with the Westinghouse Life-Line chemical motor than with any other. Take this example:

An Eastern Fuel and Gas Company has a cyanide pump that pumps thyocyanate. At times the pump leaks, throwing thyocyanate over the motor. Conventional motors rotted out at the feet in about six months. A Life-Line installed on this same pump for over a year brought this statement from the foreman of electrical maintenance:

"This is the first motor we did not have to drill out the bolts and screws to take the motor apart. A closer inspection of the motor showed the end brackets and frame in excellent shape; the fan, windings and rotor looked as good as the day they left the motor plant."

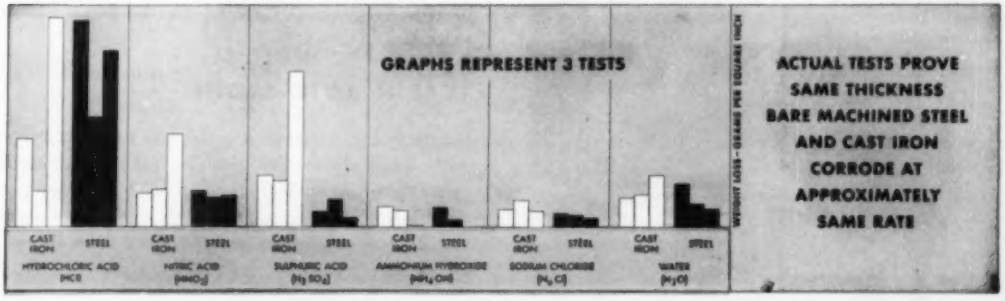
Consider the five plus bands of protection. You'll understand this extra life. The frame, feet, and brackets are steel. (*Note: Steel and cast iron of same thickness have approximately equal corrosion resistance. See graph below.*)

This steel is first Bonderized then a formaldehyde alkyd-type enamel, well known for its superior corrosion resistance, is baked on. Two dips and bakes of tough, flexible Thermoset varnish follow. Finally, the motor is sprayed with a finish coat of gray lacquer. Five bands for longest life!

DO YOU NEED SOMETHING EXTRA IN A MOTOR?

Extra protection against corrosion—or outage from any cause? Check Life-Line—they cost no more. Ask your Westinghouse representative for a copy of Chemical Motor Booklet B-4687, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-21657



YOU CAN BE SURE...IF IT'S

Westinghouse

Life-Line

MOTORS and CONTROLS

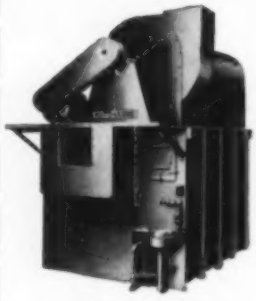
Get the facts...on "Engineered Dust Control"

You are cordially invited to
visit Booths Nos. 413 and 414 at the 23rd
Exposition of Chemical Industries to inspect the latest
developments in ROTO-CLONE Dust Control
Equipment and Cyclone Air Cleaners.

American Air Filter
COMPANY, INC.
326 Central Avenue, Louisville 8, Kentucky



Let us show you operating models



Type N Roto-Clone



To control or salvage chemical process dust . . . from blending, coating, conveying, filling, screening and many other dust sources.

TYPE N ROTO-CLONE

See the full scale operating model with visual cut-aways. A No. 8 unit of 8000 CFM capacity, it shows in complete detail the principle and advantages of hydro-static precipitation. See for yourself how the Type N recycles water for minimum requirement, and cleans dust laden air without the aid of a single moving part.

Other operating models:

TYPE W ROTO-CLONE • CYCOIL OIL BATH AIR CLEANER • TYPE CMS MULTI-DUTY FILTER

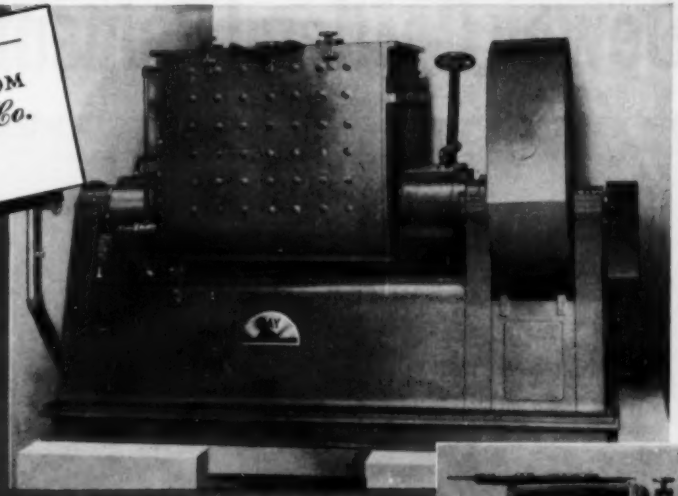
American Air Filter makes the only complete line of dust control and air filtering equipment.

AAF

American Air Filter
COMPANY INC.,

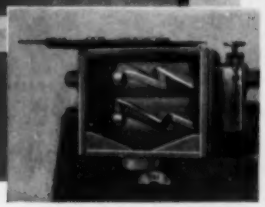
326 Central Ave., Louisville 8, Kentucky • In Canada: Darling Bros., Ltd., Montreal, P. Q.

AN *Invitation* FROM
The J. H. Day Co.
INCORPORATED



SEE
the DAY Line of
CHEMICAL PROCESSING EQUIPMENT

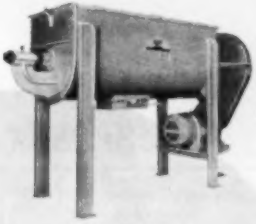
23rd EXPOSITION OF CHEMICAL INDUSTRIES
Grand Central Palace, New York City
November 26 to December 1 • Space 718-721



DAY IMPERIAL MIXER Especially designed for rubber cements, plastics, pigment pastes, coatings and similar products. Counter-rotating blades, operating at 2-to-1 ratio, guarantee fast, thorough dispersion.



DAY DISPERSION MILLS for paints, inks, ointments, plastics, chocolate and allied products.

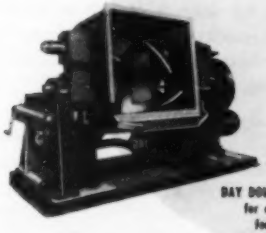


DAY B-10 BLENDER for powders, pastes, liquids.

Half a century of service to chemical industries backs the DAY claim of dependability. See for yourself why DAY equipment is the standard for quality chemical processing.



DAY GEARLESS PONY MIXER for mixing pigments in vehicles.



DAY DOUBLE ARM MIXER for clays, plastics, food products.



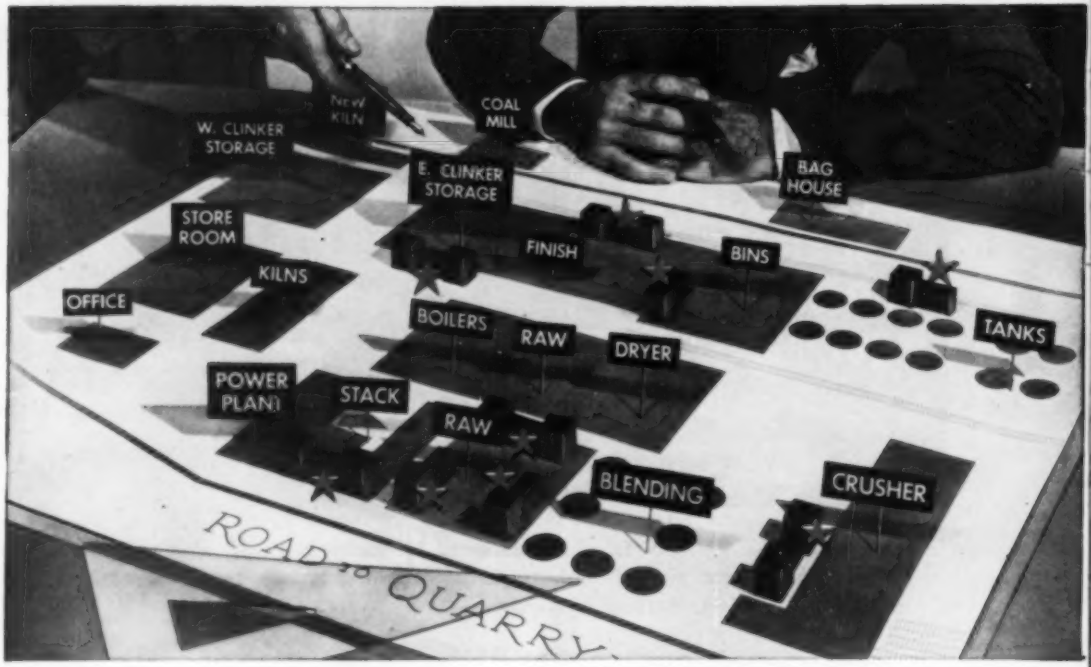
DAY RO-BALL SCREEN for all precision sifting and screening operations.

DAY

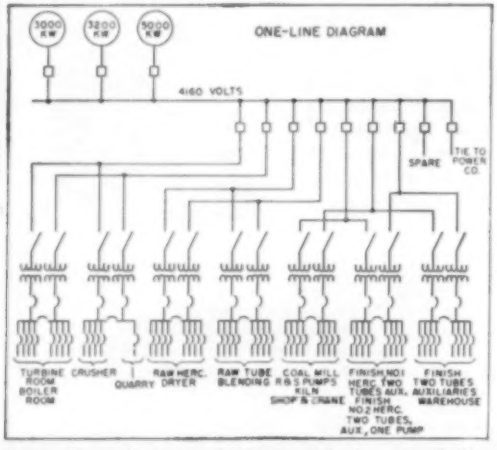
1147 HARRISON AVE., CINCINNATI, OHIO

THE J. H. DAY COMPANY, CINCINNATI 22, OHIO
INCORPORATED

Dewey Portland Cement Co. solves



Modernized System gives additional capacity



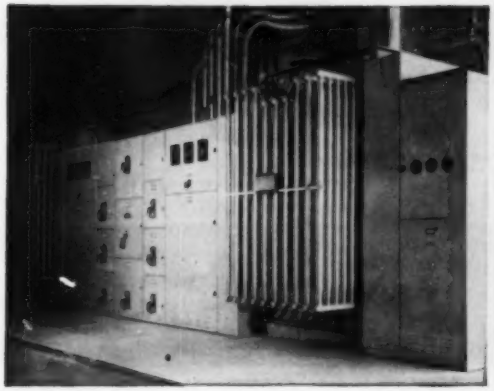
One-line diagram showing new load-center distribution system. Turbine-generators supply voltage at 4160 volts wye. High voltage is stepped down to utilization level 480Y/277-v right in the load areas. Two sources of power for each load-center unit assure the 24-hour-a-day service.

For 30 years, waste heat from the cement kilns has enabled the Dewey Portland Cement Company to generate most of its power. Additional power for peak loads and emergency conditions is supplied by a local utility.

Recently, increasing demands exceeded the capacity of the Company's two turbine generators, rated 3200 kw and 3000 kw, both at 480 volts. Since inadequate interrupting capacity of the switchgear equipments prevented further use of the local utility power, a critical problem developed.



a critical power supply problem



Double-ended load-center unit rated at 3000 kva. Seven of these are located throughout the plant. Since all units are the same size, it was possible to standardize switches, transformers, and breakers.



Old switchboard with exposed switches and conductors threatened safety of plant and personnel. Old oil circuit breakers could not provide adequate interrupting capacity if short circuit occurred.

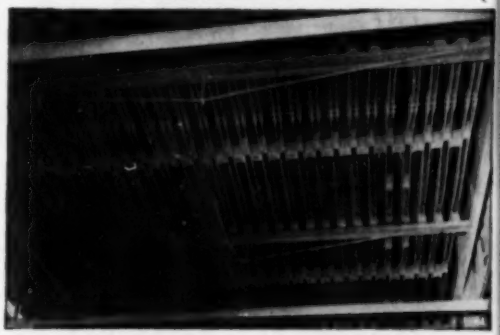
Load-center distribution key to power expansion

Called in by the Dewey Portland Cement Co., Dewey, Okla., G-E engineers found that an additional 5000 kw required by the plant could be supplied by a modern General Electric turbine generator, utilizing available waste heat.

G-E specialists recommended a generated voltage of 4160 wye. Existing 480-volt generators were rewound and load-center unit substations were used to step down the voltage to utilization levels right in each of the plant load areas.

High voltage distribution eliminated tremendous quantities of heavy low-voltage conductor. Voltage drop was reduced. Flexibility was increased because later increases in power demand can be met by the simple addition of more load-center units without altering the over-all system.

Here's a typical example of the way General Electric engineers are helping industry meet today's demands for more power. For further information, contact your G-E sales representative, or write for Bulletins GEA-5600—"Power for Industry's Third and Biggest Expansion" and GEA-3592—"Load-center Unit Substations." *General Electric Co., Schenectady 5, N. Y.*



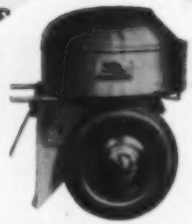
¼" x 6" bus previously needed to distribute power at 480 volts made this roof a veritable "copper mine." With new high-voltage distribution, buses were eliminated.



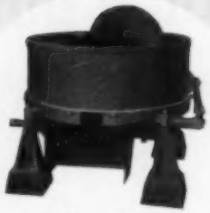
New metal-clad switchgear has adequate interrupting capacity. All breakers are rated 4160 volts, 1200 amperes, 250,000 kva. Completely metal enclosed, they provide greater protection for personnel.

GENERAL ELECTRIC

321-81



Porto-Muller—3'3" pan dia., 3 hp—1800 rpm—2½ - 3 cu. ft. capacity (100% Portable)



No. 1 Mixer—4' pan dia., 5 and 7½ hp—1800 rpm—3 - 4 cu. ft. capacity

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ARTIFICIAL ST T TILES . . .
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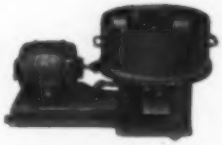
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SANITARY WARES . . . . TERRA COTTA . . . ALS
WHITEWARE . . . . ZINC BLENDS . . . . ZIRCON RICAL



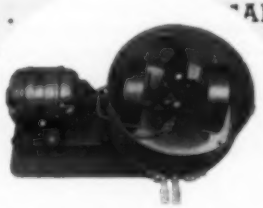
No. 0 Mixer—3' pan dia., 5 hp—1200 rpm—1 - 1½ cu. ft. capacity



No. 00 Mixer—24" pan dia., 1½ hp—1200 rpm—¼ - ½ cu. ft. capacity



Laboratory mixer—24" pan dia., 1½ hp—1200 rpm—¼ - ½ cu. ft. capacity

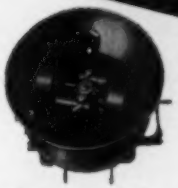


Laboratory Mixer—18" pan dia., ¾ hp—1800 rpm—1/10 - 1/5 cu. ft. capacity

See MULLING demonstrated in BOOTHS 554 - 555 1951 CHEMICAL EXPOSITION



No. 1H Mixer—4' pan dia., 5 and 7½ hp—1800 rpm—4 cu. ft. capacity (Semi-Portable)



No. 1½ Mixer—4½' pan dia., 7½ or 10 hp—1200 - 1800 rpm 5 - 6 cu. ft. capacity

Mix-Muller®

10 MODELS

UNLIMITED Mixing Applications in the Chemical-Process Industries

IF you prepare dry—semidry—or pasty material—in any application from Abrasives to Zirconia you can do the job *faster, much more accurately and at less cost* with Simpson Mix-Mullers.

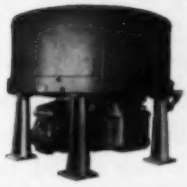
Ten tested and proved models ranging in capacities from 1/10 to 30 cu. ft. have been engineered to accommodate practically every production schedule. They may be specially equipped for heating or cooling while mixing—for mixing under pressure or vacuum—for corrosive materials—or to function as reaction vessels.

Though vastly different in size and type of installation . . . *all* Simpson Mix-Mullers incorporate the same *true* mulling principle of mixing that has proved so successful throughout the chemical-process industries wherever accurate, controlled, mixing and blending is required.

Realize the advantages of Simpson Mix-Mullers in your own operation. Consult a National Engineer for more information today . . . or write for details about our free laboratory service to prove the results of mulling your product in a Simpson Mix-Muller.



No. 2 Mixer—6' pan dia., 15, 20 or 25 hp—1200 or 1800 rpm 12 - 15 cu. ft. capacity

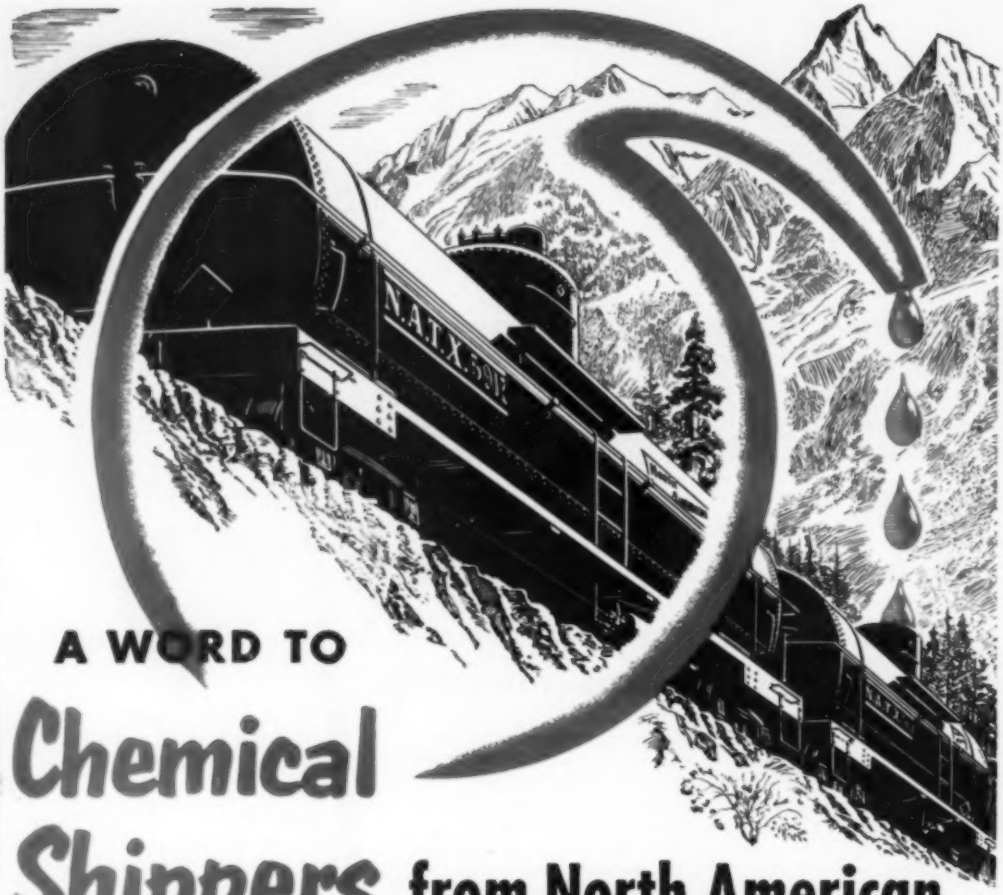


No. 3 Mixer—8' pan dia., 40 or 50 hp—1800 rpm—25 - 30 cu. ft. capacity



SIMPSON





A WORD TO Chemical Shippers from North American

Today's zooming production has created demands for North American specialized tank cars that far exceed supply. To help meet these expanded requirements, North American is working hard to keep all tank cars rolling every minute possible . . . striving hard for maximum availability in order to better serve shippers from coast to coast. And, as always, North American stands ready to apply 43 years' transportation experience to any shipping problem of the chemical industry.



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739 PILLSBURY AVENUE, ST. PAUL 4, MINN.

NORTH AMERICAN CAR CORPORATION

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Marks of Progress in Modern Methods...

KAYLO HEAT INSULATION

Keeping pace with advancements in modern processing methods is a revolutionary heat-saving material—Kaylo Heat Insulation. This unique material, a hydrous calcium silicate introduced by Owens-Illinois after many years of research, offers outstanding advantages to the chemical industry.

Kaylo Heat Insulation is *effective* up to 1200° F. Therefore, it eliminates the need for combination coverings in nearly all operating conditions. What's more, Kaylo Heat Insulation is incombustible and insoluble in water; has exceptionally good dimensional stability. It retains its original insulating *efficiency* in long service.

The high strength of Kaylo Heat Insulation practically eliminates breakage, in transit or on the job—even permits workmen to walk on insulated equipment. Yet Kaylo Heat Insulation is extremely lightweight. Its ease of handling, cutting and fitting helps speed application.



Mississippi Chemical Corporation's new nitrogen fertilizer plant, Yazoo City, Mississippi. Gas reforming plant, Girbotol acid gas units, ammonia synthesis unit, nitric acid process unit, ammonium nitrate prilling plant, steam and utility piping are insulated with Kaylo Heat Insulation. Girdler Corporation, Louisville, Ky., general contractor; Industrial Insulators, Houston, Tex., insulation contractor.



KAYLO PIPE INSULATION is made to Simplified Dimensional Standards of thicknesses and diameters. Coverings are sectional for tube and pipe sizes ¼" to 12"; tri-segmental up to 23"; quad-segmental up to 41"; K-segmental (18" wide segments) up to 72" in diameter.

KAYLO HEAT INSULATING BLOCK is made in all standard sizes and thicknesses from 1" to 6" for flat surfaces and for vessels larger than 60' in diameter; curved block 18" wide for smaller vessels.

For complete details on Kaylo Heat Insulation, write Dept. N-183, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

SEE OUR CATALOG IN

KAYLO® ... *first in calcium silicate*

...*pioneered by* OWENS-ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO—KAYLO SALES OFFICES: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND DETROIT • HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

Cut Mixing Time* with NEW PREMIER



PREMIER SIMPLEX DISPERSATOR

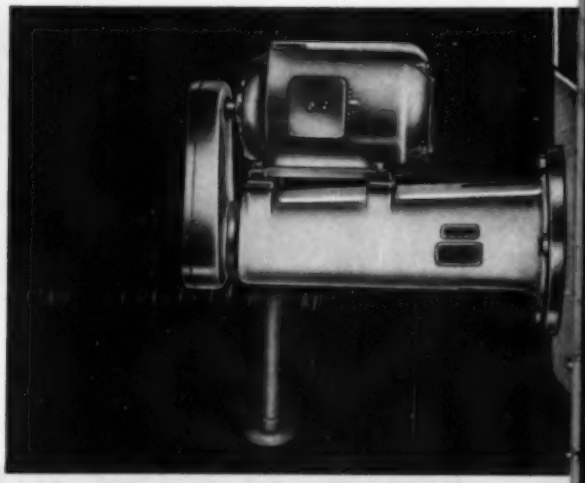
The SIMPLEX DISPERSATOR is a slotted cylinder rotating at high speed. The centrifugal force resulting from this high-speed rotation forces the products through the slots under considerable pressure. A double shearing effect is thus obtained. The product is sheared at high speed as it passes through the slots; the columns of liquid emerging from the slots are further sheared as they make contact with the relatively slower-moving mass of liquid outside the cylinder.

MIXES IN FRACTION OF TIME REQUIRED BY PROPELLERS

Suppose you want a liquid/solid reaction to produce a gelatinous product. Normally, each solid particle becomes coated with a gelatinous layer. Until this insulating layer is removed, the reaction cannot be completed. Propellers remove the layer very gradually. The SIMPLEX DISPERSATOR shears off the gelatinous insulation from the solid particles almost immediately, with little or no slowing down of reaction time. Thus a process which may take hours or days with a propeller mixer can be completed in minutes or even seconds with a SIMPLEX DISPERSATOR.

TRANSPORTABLE DISPERSATOR UNIT

1½ H.P. 4' shaft length is adjustable. Universal clamp permits rigid mounting in any desired position. Built-in control switch permits instant stop-start control. Hollow motor shaft insures maximum bearing spread for shaft support.



*DISPERSATORS MAY BE USED TO SAVE PROCESSING TIME FOR THESE APPLICATIONS

Mixing
Agitating
Suspending
Blending
Emulsifying
Dispersing
Wetting
Reacting
Pigmenting
Reducing
Shearing
Homogenizing
Disintegrating
Washing
Contacting
Smoothing
Dissolving

PREMIER MILL

2180 GENESEE STREET

GENEVA, N. Y.

DISPERSATORS *Engineered for Precision Mixing*

PREMIER DUPLEX DISPERSATOR

The success of the SIMPLEX DISPERSATOR in the high-speed, low-to-medium viscosity mixing field, has led Premier engineers to develop a second model, the DUPLEX DISPERSATOR, which has extended the benefits of the Dispersator action into high-viscosity, low-speed applications.

Whereas the SIMPLEX DISPERSATOR has a single-flow direction, the DUPLEX DISPERSATOR permits *two-way* flow, by virtue of a double cone construction which forces liquids to enter the rotating cylinder from both top and bottom. This *two-way* flow forces intense mixing and wetting action in the lower cone before liquids escape through wall slots.

Thus the DUPLEX DISPERSATOR may be used effectively to mix or blend two liquids of different specific gravity. It is ideal for drawing heavy solids from the bottom and light materials from the surface to insure thorough wetting and dispersion.

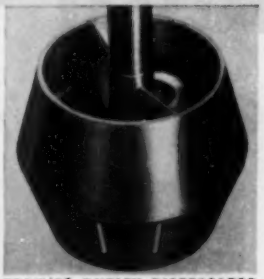
The DUPLEX DISPERSATOR, due to its double-flow action, will mix fluids of greater viscosity than the single-cone SIMPLEX DISPERSATOR. This is an important function in the blending of color pastes and in promoting chemical reactions in mixtures which become highly viscous as the reaction is completed.

SIDE ENTRY DISPERSATOR UNIT

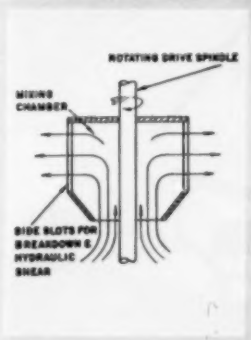
5 H. P. Side Entry Unit. Chain drive enclosed in oil bath insures high load, smooth drive. Sealed bearings insure long life and minimum service and are mounted to absorb full radial and thrust loads. Seals are engineered for positive liquid control.

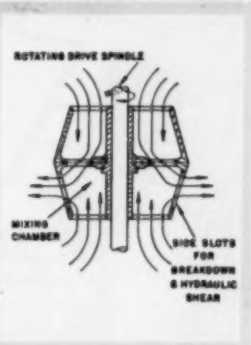


PREMIER SIMPLEX DISPERSATOR

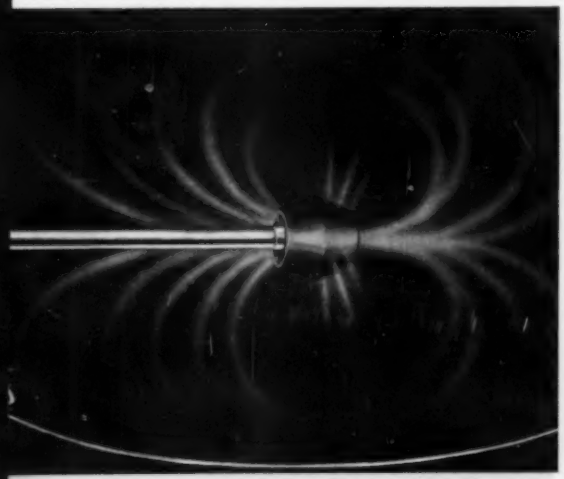


PREMIER DUPLEX DISPERSATOR





Patents Applied For



LABORATORY DISPERSATOR UNIT

• Laboratory or pilot plant model, which you can use to prove the revolutionary features of the Dispersator on a small scale and at low cost. Air motor drive models also available.



FLEXIBLE DRIVE

For greater ease of operation and when thin tank walls present a problem, all models can be supplied with flexible shaft drives on request.

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CORPORATION

ASK OUR ENGINEERS

If your mixing, dispersing or reacting time is excessive, tell your problem to our engineers. If you give full details, they can help you by recommending the right model and size Dispersator to solve your problem.

MAIL THIS COUPON TODAY!

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Send me full details of the SIMPLEX DISPERSATOR and the DUPLEX DISPERSATOR.

Name .....

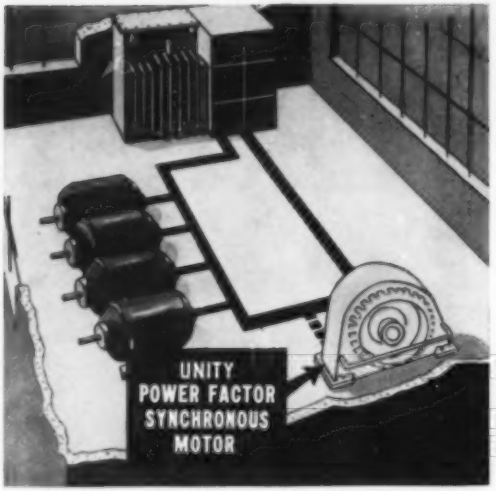
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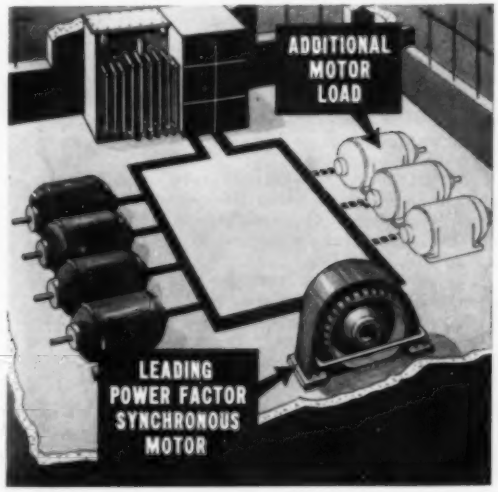
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If your plant power system is loaded close to full capacity and you have a place where a large constant-speed motor can be used, you may be able to install a *unity power-factor* synchronous motor without increasing the kva load on your system.

Or, if your power system is already overloaded, then a *leading power-factor* synchronous motor can actually supply kvars to your system while performing its usual drive duties. Then you can often install additional inductive apparatus to an existing system without fear of overloading feeder lines.

If you are planning plant expansion or you need more motors and/or suspect power system overloading, contact the nearest G-E sales engineer. He'll help you survey your system, and help you determine the type of synchronous motor you need—should this be one answer to your power system problems. *General Electric Company, Schenectady, N.Y.*

NEW! A Helpful Training Course on Motors!

Everyone concerned with technical training problems will want this new G-E Motor Selection and Application Course. Consists of 9 short, easily understood lessons. Complete kit—slide films, review booklets and instructor's manual—$100. Call or write your nearest G-E sales office, or send for free copy of 96-page instructor's manual.

Look at the scope of this Course

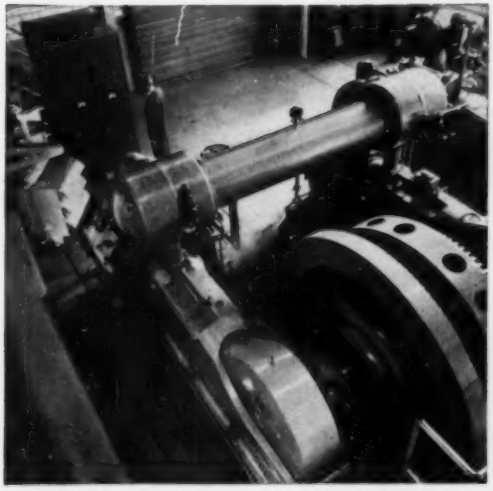


1. Fundamentals of Motors
2. Types of Motors
3. Fundamentals of Selection
4. A-c Induction Motors
5. Single-phase Motors
6. D-c Motors
7. Synchronous Motors
8. Adjustable-speed Drives
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of your power system

for unity and leading power-factor drives



Control, too, will protect your system—G-E Limitamp high-voltage control provides ample interrupting capacity, protection for operating personnel, good appearance, and compactness. Here it controls and protects a 350-hp G-E synchronous motor.

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Check power factor on individual circuits—easily, quickly—with new G-E hook-on power-factor meter. This portable instrument hooks around the line—no cutting of conductors, no costly shutdowns to make power checks. You can accurately locate those circuits where corrective action is needed.

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Please send me the following literature. . .

- ☐ for reference purposes
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( ) GER-234—Synchronous Motors Do Two Jobs at One Time
( ) GEA-5332—Low-speed Synchronous Motors
( ) GEA-5426—High-speed Synchronous Motors
( ) GEA-5469—G-E Testing Instruments
( ) GEZ-310—Motor Training Course Instructor's Manual

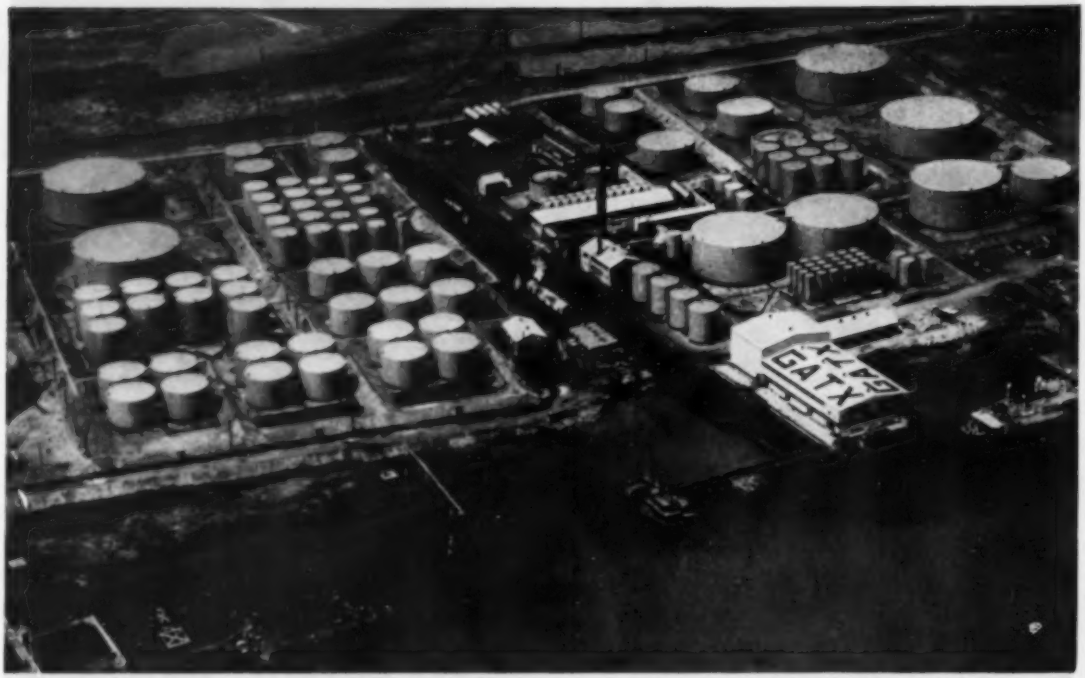
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Aerial view of Carteret, N. J. terminal

Your petroleum products *packed in drums or barrels . . .*

With no investment in equipment, General American customers at Carteret, N. J., and Goodhope, La. enjoy all the convenience of private barreling and drumming.

Your own product . . . blended to your specifications, can be handled in this manner . . . packed and ready for quick distribution. These two terminals also offer complete facilities for rapid canning of petroleum products in all size containers including one-quart.



NOW IT'S FIVE STRATEGICALLY LOCATED TERMINALS EQUIPPED TO HANDLE ANYTHING THAT FLOWS THROUGH A PIPELINE— Alcohol, benzol, creosote, petroleum or vegetable oil, etc.

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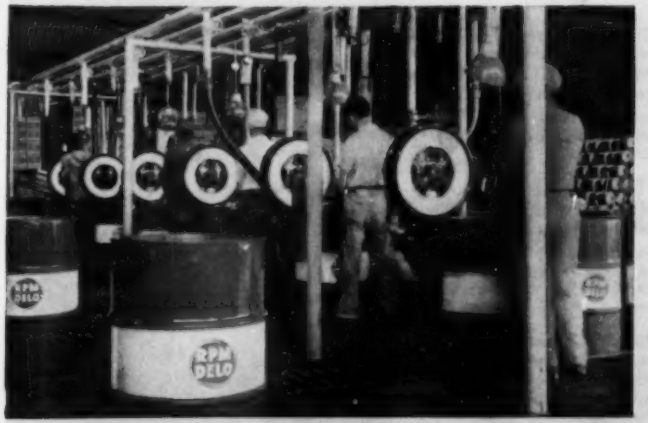
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Make the Midwest your market! Develop the potential of this great inland industrial center. Enjoy all the advantages of your own private terminal . . . without risking capital . . . *without making any investment.*

The new terminal is ideally situated near Chicago's Clearing Industrial District at 67th and Archer on the Sanitary and Ship Canal. It's fully equipped with most modern facilities—special equipment guards against contamination of different types of liquids—protection against excessive evaporation, fire and explosion. Everything for safe, profitable storage and complete distribution at lowest cost.

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GENERAL AMERICAN TANK STORAGE TERMINALS

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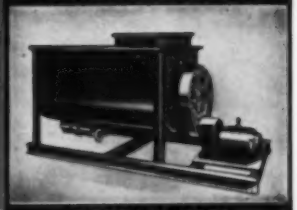


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To the Chemical and allied Industries, INTERNATIONAL ENGINEERING offers the most complete line of Modern PROCESSING EQUIPMENT ever presented—with a completely INTEGRATED and perfectly BALANCED SYSTEM of operation, for the highest efficiency and lowest costs.

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Memo from the Editor John R. Callaham



Author Wilson and Editor Callaham lunch at Le Cheval Blanc, discuss . . .

Where to Eat in New York

So you're coming to the New York Chem Show? You'll have to eat—but where? For the gourmets among you, here's a check list prepared by gourmet Wilson.

If good food is what you want, or if you go for unusual dishes, New York is the place. No other city on earth can offer you such a variety of superb and exotic foods.

This capital of the world's food is said to have 50,000 eating places. If you ate every meal in a different New York restaurant from the time you were 20 years old you would be 70 before you covered them all. By that time there would be about 20,000 new ones to try!

Author of this check-list—A. J. P. Wilson—is a consulting chemical engineer, a native New Yorker and author of "100 of the Best and Most Unusual Places to Eat in New York City" (McClunn & Co.). This list, he says, has been prepared for CE "from my experiences of over 30 years of eating in New York restaurants, good and bad."

With the exception of those marked "downtown," all the restaurants in this list are within walking distance or a short taxi ride of Grand Central Palace where the Chem Show will be held on November 26-December 1.

AMERICAN

Stouffer's, Park Ave. & 42nd St.
Good food at moderate prices

Grand Central Oyster Bar, Park Ave. & 42nd St.
Oysters; sea food

Sweets Restaurant, 2 Fulton St. (downtown)
Excellent sea food

Cella Christ, 144 East 45th St.
Expensive; steaks and chops

Press Box, 139 East 45th St.
Newspaper people

Pen & Pencil Restaurant, 203 E. 45th St.
Artists and press

Harvey's, 509 Third Ave.
Deviled lobster; sea food

Fraunces Tavern, Broad & Pearl St. (downtown)
Historic; lunch only

Stork Club, 3 East 53rd St.
Expensive; night club; celebrities

El Morocco, 51 East 55th St.
Expensive; night club; society

Barney's Steak House, 340 Lexington Ave.
Hamburgers; steaks

Algonquin Hotel, 59 West 44th St.
Literary crowd

White Turkey, 12 East 49th St.
Expensive; famous American dinners

Ye Olde Chop House, 118 Cedar St. (downtown)
Mutton chops; 148 yr. old

Colony, 30 East 61st St.
Expensive; society

Waldorf Astoria Hotel, Park Ave. & 50th St.
Expensive

Schrafft's Colonial Room, 556 Fifth Ave.
Good food; moderate prices

Hearthside, 13 East 48th St.
Black bean soup; fried chicken

Kirby Allen, 797 Madison Ave.
Tea room

ARMENIAN

Golden Horn, 31 West 51st St.
Sheesh kebab; excellent desserts

CHINESE

Lum Fong, 150 West 52nd St.
Lobster cantonese

Freeman Chum's Restaurant, 142 East 53rd St.
Moo goo gai pan

Lichee Wan, 11 Mott St. (Chinatown, downtown)
Butterfly shrimps

DANISH

Wivel, 254 West 54th St.
Smorgasbord; night club

FRENCH

Le Pavillon, 5 East 55th St.
Expensive; fine foods; society

Le Cheval Blanc, 145 West 45th St.
Patie foie; mussels; calf's brains

Cafe Chambord, 803 Third Ave.
Expensive

GERMAN

Blue Ribbon, 145 West 44th St.
Fine German dishes

Luchows, 100 East 14th St. (midtown)
Wonderful German food

HUNGARIAN

Tokay Cafe, 1591 Second Ave.
Gypsy music; night club

INDIAN

Ceylon India Inn, 148 West 49th St.
Curries

ITALIAN

Colombo's Restaurant, 302 East 45th St.
Steaks and hamburgers

Giovanni Restaurant, 66 East 55th St.
Gnocchi, zabaglionne

Gratto Azurra, 387 Broome St. (downtown)
Lobster fra diavolo

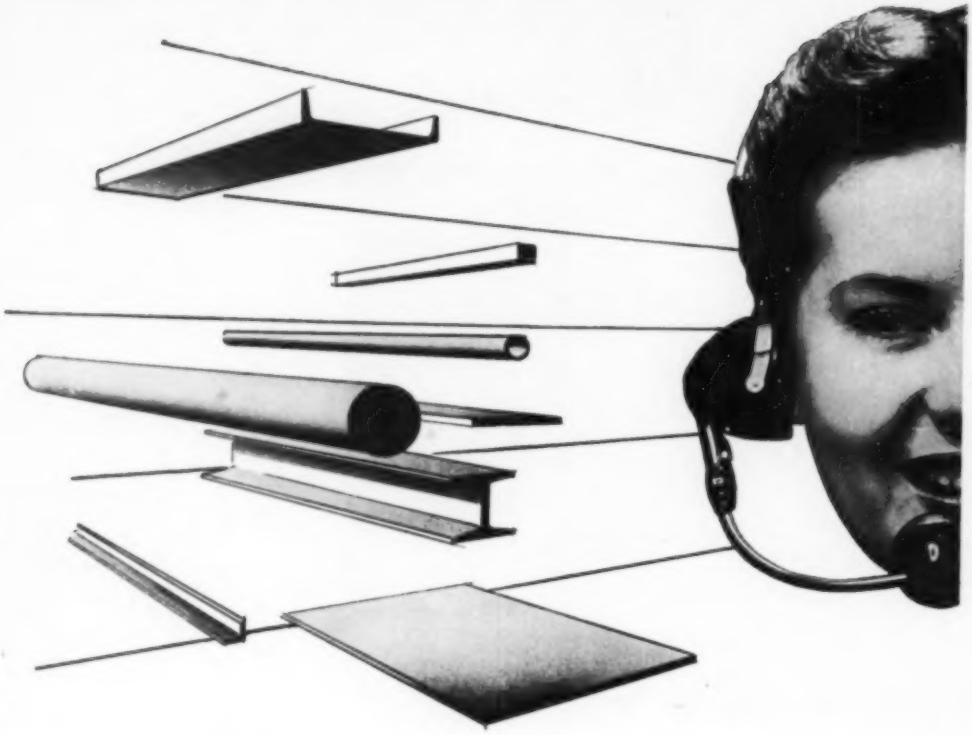
Enrico & Paglieri, 64 West 11th St. (Greenwich Village)
Spaghetti

JAPANESE

Miyako, 20 West 56th St.
Tempura; suki yaki

RUSSIAN

Russian Tea Room, 50 West 57th St.
Shaslik; blini; halvah



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Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

NOVEMBER 1951

Your Show of Shows

Remember your first "Chem Show" in New York? Wasn't it a memorable experience to find yourself surrounded by hundreds of exhibits with every conceivable kind of chemical engineering materials, equipment and services? Some of that same thrill is in store for you again soon. When the familiar doors of Grand Central Palace open at noon Monday, November 26, you are going to find the 23rd Exposition of the Chemical Industries bigger and better than ever before.

This year there will be more than 400 exhibitors on hand to show you their latest developments in process equipment, machinery, instruments, and chemical products. They will welcome an opportunity to talk to you about your problems—to make available their specialized knowledge and experience. You, in turn, will be building up your own store of information and data for future use in our fast-growing, rapidly changing field of industry.

This issue of *Chemical Engineering* has been prepared to help you get the most from your visit to the Chem Show. So has our new Exposition Guide and Directory, which this year has been consolidated with that of our sister publication, *Chemical Week*, and will be available as you enter the Exposition Building.

For those of you who cannot attend this "show of shows," may we respectfully suggest that the next best thing is an extraordinarily thorough study of the editorial and advertising pages of this issue of CE. We are proud and privileged to present the records of so many interesting advances and achievements of our industry and profession.

A Better Day for GI Ph.D.'s

Some of us in the past may have been a little too free in criticizing the Armed Forces for their use of enlisted scientific and professional personnel. A few years ago it was the fad to gripe about potato-peeling Ph.D.'s or the chemical engineering orderlies at the base hospital. But lately we have been encouraged to think that this is no longer the order of the day.

During a recent visit to the Army Chemical Center we read a memorandum that Major General E. F. Bullene had addressed to the commanders of all Chemical Corps installations. After forcefully stating his desire to promote efficiency and economy in the utilization of such personnel, the Chemical Chief made this significant statement:

> "The critical shortage of technical manpower makes it an inherent responsibility of commanding officers and supervisory personnel of all echelons to assure that each enlisted specialist is assigned duties commensurate with his education, training and experience."

Later in the day, Brig. Gen. William M. Creasy, who is an able chemical engineer in his own right, took us on a personally conducted tour of the Research and Engineering Division. We met many fine young engineers and chemists in uniform working at desks or laboratory benches alongside of civilian specialists. On inquiring, we found that all had completed the basic military training required for their own protection as well as that of the corps they serve. But they were encouraged, as we were, with their opportunity to put their special skills and experience to more efficient use in the technical fields for which they were trained.

Where the Manpower?

Many organizations talk glibly about ever-expanding research programs. Sometimes these plans overlook the fact that men as well as money and materials must be available for a first-class job. Unfortunately, they are not.

Dr. Byron T. Shaw, Deputy Administrator of Agricultural Research Administration, spotlighted the problem, quite unconsciously, in the following statement:

> "A recent poll of 41 chemical companies indicated that their research is continuing to expand. At mid-year they had already hired as many professional people as they had in all of 1950, and they plan to double that number by the end of this year. On the basis of the figures reported, their research staffs in 1952 will be four times as large as they were in 1949."

We suspect that these chemical companies are still out hunting for good prospective research workers. We know that the government is also. But this competition is good for no one, least of all for the youngsters who will get much bigger salaries than their experience or performance will warrant.

The Story Behind the Phillips Story . . .

En Route Home From Oklahoma
Saturday, 9-22-51.

Dear John:

It looks like I am going to have to put in for overtime. Yesterday Wally and I covered about 1,000 miles by air and car and visited 7 Phillips plants in 14 hours. Here, for the record, is a bill of particulars:

Phil Arnold 'roused us out of bed for a 7:00 a.m. breakfast in the employees cafeteria in the new Adams Building—one of the world's finest. The parting comment of the driver who hurried us to the Bartlesville airport: "I don't know where you fellows are going, but it won't take very long."

We soon saw the reason: a newly converted A-26 bomber that will carry 4 or 5 passengers at better than 300 mph.

Shortly after 7:30 we climbed up the ladder into the belly of the shiny bomber and were off for the Texas Panhandle. Eighty minutes and 400 miles later we put down at a former Air Force training station near Dalhart, Tex.

We were met by Tom Hipp, superintendent of the Cactus Plant of Phillips Chemical Co. who turns out to be another Kansas engineering classmate of Waldo Bowman (*Engineering News-Record* Editor). Incidentally, John, this company is full of Jayhawkers, including K. S. "Boots" Adams, chairman; Paul Endacott, president; and Stanley Learned, executive vice president.

After 40 minutes and 40 miles of comfortable driving we arrived at the ammonia plant and were met by Ross W. Thomas, v.p. for Research and Development, and C. Keith Buell, manager of R&D's Chemical Engineering Division. Our program called for a leisurely tramp through this huge plant where Phillips turned out 140,000 tons of synthetic ammonia last year. Then we went over to the adjoining ammonium nitrate works. An impressive feature of this plant, also of the surrounding landscape, is a 12-story all-aluminum "prilling" tower. I agreed with Wally that half-way was far enough to climb.

Due at the Dumas gasoline plant at 11:30, we found ourselves behind schedule and had to be content with an automobile tour personally conducted by D. E. Logan, superintendent. Besides, we were hungry, and Borger Hotel was still a half hour's drive. Mr. Staley, the Manager, had a fine lunch waiting for us there despite the fact that his busy hostelry was filled with a delegation of technical men from the rubber industry. You'd be surprised how many rubber compounders are beating a path to Borger these days!

First stop after lunch was at the Philtex Experiment Station where we inspected that first refrigerated pilot plant for cold rubber which Jack Hightower described for us in June 1948. We also saw the boys making some experimental runs on the new super abrasion carbon black (SAF) said to be even better than the famous Award winning Philblack O. Separation, purification and refining of hydrocarbons for reference fuels and research is a precision operation at Philtex—but carried out on a comparatively large scale.

We were welcomed at the huge Phillips refinery by G. E. McKenna, superintendent, and his assistant, V. C. Cavin. Here Keith Buell proudly pointed out some of the new types of instrumentation developed, built and installed by R&D chemical engineers. We got a look at the new cat cracker and proceeded to the famous Borger Fractionators. They include a 200-tray distilling column that will split anything short of atoms.

By this time it was 4:15 and we had not yet seen the world's largest furnace black plant, the big butadiene operations at Plains, or the government-owned and Phillips-operated cold rubber plant. But apparently the day was still young.

Half an hour later we changed our clothes from head to toe and were rigged out in new coveralls, sneakers, gloves and caps and had our faces daubed with protective cream. In this garb we were ready to invade the black art of Borger to collect our material for the November Award article [see pages 145 to 152]. Long-legged Phil paced our progress as we climbed to the top of the reactors and collected even more "material" in our ears, eyebrows and hair [see cuts]. I was surprised how easily the black stuff came off with soap and water plus liberal use of "baby oil" around eyes, ears, nose and throat.

It was almost dark when we pulled ourselves away from the copolymer plant for an hour's fast driving to the airport at Amarillo. Here our Phillips 66 simulated rocket had come on from Dalhart and was impatiently waiting to take off for Bartlesville. The return flight took all of 90 minutes and by a little after 9:00 we were gathered around the festive board in the beautiful ranch-type home of Ross and Lorraine Thomas. Unfortunately, I had to leave early (10:30) to keep a date with Ed Jamison who wrote that LPG article for us in May '50.

But at that, I got to bed by midnight and slept like a baby till 5:30 this morning. By 6:00 we were on our way to Tulsa to catch a little breakfast and this American Airliner DC-6 for non-stop flight to Washington. We will be home by 3:00 and at the office Monday at 9:00. Next time, I hope the Award Committee will pick a winner nearer home.

Sid



BEFORE the working press looked into the black art of Borger. CE's Editorial Director Sid Kirkpatrick and Publisher Wally Traendly supported at left by Phil Arnold, manager of research and development, and Keith Buell, director of chemical engineering. Handsome engineer at right: Ross W. Thomas, vice president, Phillips Petroleum Co.



AFTER they collected a lot of "material" for the Chemical Engineering Award article, mostly in their eyes, ears and throats.





Better Rubber

Its Challenge and Achievement

CHEMICAL ENGINEERING's first great wartime achievement was the American synthetic rubber industry. In 1943 we honored the sixty-seven chemical, rubber and petroleum companies most responsible for that vital accomplishment. They accepted our award with this challenge: "It is our job to see that this industry continues to advance toward higher quality and lower costs so that we shall never again lose the advantages we have gained in our war for rubber independence."

This month the 1951 Award for Chemical Engineering Achievement again honors the Phillips Petroleum Co. for its valiant role in meeting the continuing challenge of the

synthetic rubber industry. At a time when many others in government and industry were enthusiastically welcoming the return of crude rubber from abroad, this company redoubled its efforts in laboratory research and pilot-plant developments. This was during a period when production of GR-S synthetic rubber had fallen from a high of 719,400 long tons in 1945 to less than 300,000 long tons in 1949. More and more plants had been placed in standby condition as Congress debated a program which would establish a 200,000-ton minimum production solely in the interests of national security. Thus it became apparent that major technological improvements were necessary if American rubber were to regain the advantages it was fast losing to the mounting import of natural rubber from the Far East.

DOUBLE ACHIEVEMENT...

Two inter-related chemical engineering achievements are recognized by the 1951 Award: First is Phillips' pioneering development of high abrasion furnace black. Second is its major contributions to the success of the cold rubber program. Together they have tipped the balance from natural to synthetic rubber for tire treads, thus making the United States more nearly self-sufficient in rubber, contributing to the nation's defense by insuring low-cost transportation.

RUBBER...

Cold rubber, like GR-S before it, was a competitive, yet cooperative enterprise. Many groups contributed to its final success. Much of the research and development work was done under the auspices of the Office of Rubber Reserve. But in the opinion of the Award Committee, a large measure of credit is due the pioneering work of the Phillips company in designing and operating the world's first refrigerated pilot plant for low temperature polymerization, in developing new recipes and chemical initiators for commercial production at 41 deg. F. and, finally, for compounding cold rubber with greatly improved furnace blacks to produce tire



treads of proved superiority in wearing characteristics.

In three years American production of cold rubber has increased to a rate of over 300,000 long tons annually – more than 40 percent of the current output of GR-S. This proportion is likely to be increased to at least 75 percent of GR-S production, which is itself being increased. Phillips participates importantly in this program through operation of a government-owned plant near Borger, Tex.

...AND BLACK

Large scale production in 1948 of its new high abrasion furnace black, known as Philblack O, came as the culmination of a dozen years of research and development. The company's original objective was to conserve its great resources of natural gas by improving upon the efficiency of the channel process, which recovers as black only about 4 percent of the carbon in the gas. Using oil as raw material, special equipment was designed to attain carbon recoveries in excess of 50 percent. Then came the long, tedious program to improve the reinforcing qualities in synthetic rubber that have now been demonstrated of such revolutionary importance that the entire carbon black industry is rapidly moving in this direction. It is estimated that by mid-1952, the production of oil furnace black by Phillips and its licensees will amount to 35 to 40 percent of the total U.S. carbon black industry.

Phillips' chemical engineers – more than 550 in all – participate in almost every phase of the company's wide-spread operations. Their work is reflected in many other significant achievements in petrochemical products and processes. But for their courage and competence in meeting the nation's challenge for better rubber, our profession is pleased and proud to present this Eleventh Award for Chemical Engineering Achievement.

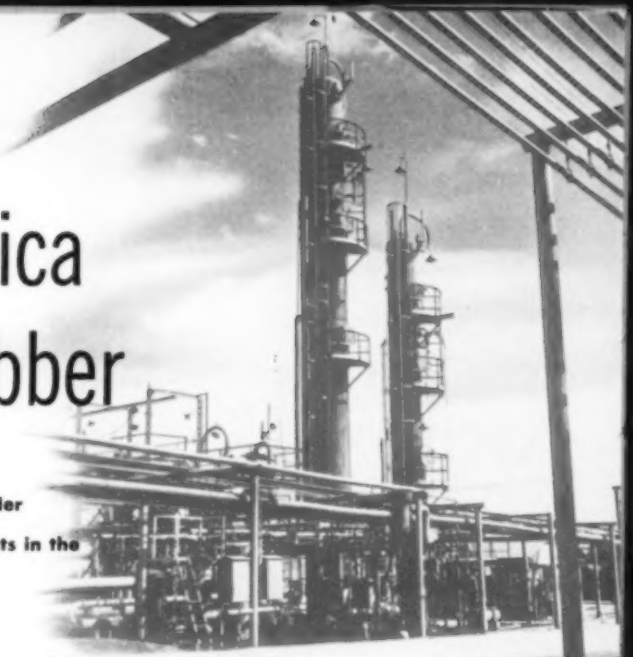
S. D. KIRKPATRICK
Secretary, Committee of Award

November, 1951

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Keeping America Rolling on Rubber

How petrochemical engineering of a high order has contributed to many related developments in the field of low-cost transportation

BY SIDNEY D. KIRKPATRICK, Editorial Director, *Chemical Engineering* and *Chemical Week*

CHARLES F. KETTERING likes to say that most Americans are stirred by the urge "to go places sitting down." That was at least one of the motivating forces behind the great automobile industry. To "Boss" Kettering it first meant mechanical and electrical achievements—the engine, the self-starter, the automotive and railroad diesels. To his proteges, Tom Midgley and "Tab" Boyd it meant an important chemical achievement—tetraethyl lead as an anti-knock compound. To the petroleum technologist it meant more and better motor fuels and lubricants. But it took World War II to teach all of us that America, in war or peace, won't roll without rubber.

Transportation, in all its aspects, is of primary concern to the petroleum industry. So it is only natural that over the years the Phillips Petroleum Co. should find this motivation for its great growth and development. Its early concern was with motor fuels, but management soon realized that to produce good products, profitably, required a broader base for its operations. It saw in natural gas, natural gasoline and refinery gases great resources too often used inefficiently or entirely wasted. So Phillips became proficient in separating, refining and liquefying petroleum hydrocarbons in order that they might be stored and shipped to fuel-hungry markets. The same proficiency in petrochemical engineering was later to lead to pioneer processes for producing butadiene, sorely needed as the basis for our synthetic rubber industry. Then followed, quite naturally, two important projects of recent years—the development of cold rubber and its companion, high abrasion carbon black. Together they have given us the basis for better tires—and the promise of continued progress toward lower cost transportation.

CARBON BLACK CAME FIRST...

Of the two chemical engineering achievements recognized by the 1951 Award, carbon black came first. As long ago as 1936 Phillips began a program to develop a more efficient process using oil to replace natural gas. Pilot plant work with an oil furnace process soon demonstrated that carbon recoveries could be increased to more than 50 percent as contrasted with only 4 percent for the old channel process plants operating on natural gas. The first commercial unit was completed and placed in operation in 1943. Its product, known as Philblack A, was widely used during the war, although when compounded with GR-S synthetic rubber, it contributed somewhat less abrasion resistance than did the comparable compounds with channel black. For certain other uses, as with butyl rubber for example, the new black soon proved its superiority.

After the war pressures eased, an all-out program was launched to develop an oil-furnace black significantly better than had theretofore been produced. This development introduced a number of unique problems and procedures. In contrast to most chemical engineering processes, the research work was done in reactors of the same size as those used for commercial production. This called for unusual skill and resourcefulness. Many of the engineering problems encountered had to be worked out and coordi-

nated during full-scale operation in units producing as much as 10,000 lb. of product per day.

Several years of intensive effort resulted in an experimental black far superior to any previously produced. Designated Philblack O, the new product injected a new element into tire compounding that might well have swung the balance in favor of GR-S even had there been no cold-rubber development. When compounded with the new cold rubber, however, Philblack O produced tire treads that consistently gave 30 to 50 percent greater wear than controls compounded with natural rubber and channel black. Little wonder, therefore, that Phillips engineers were called upon to design and construct what has now become the world's largest plant for the production of furnace blacks.

The accompanying table shows the total production of carbon blacks in the United States from 1943, with the proportion of furnace blacks produced by Phillips. It is significant that in seven years the latter has mounted from 0 to 13 percent of the total carbon black production. In 1950 the Philblacks accounted for 23 percent of the total furnace blacks, 48 percent of the oil furnace black. The company estimates that by mid-1952 its own oil furnace black production and that of its licensees will be at the rate of over 750 million pounds per year — perhaps as much as 40 percent of the total U.S. production.

Philblack O is made by pyrolytically decomposing a special gas-oil fraction in a refractory-lined steel reactor. The process is illustrated in the accompanying chart.

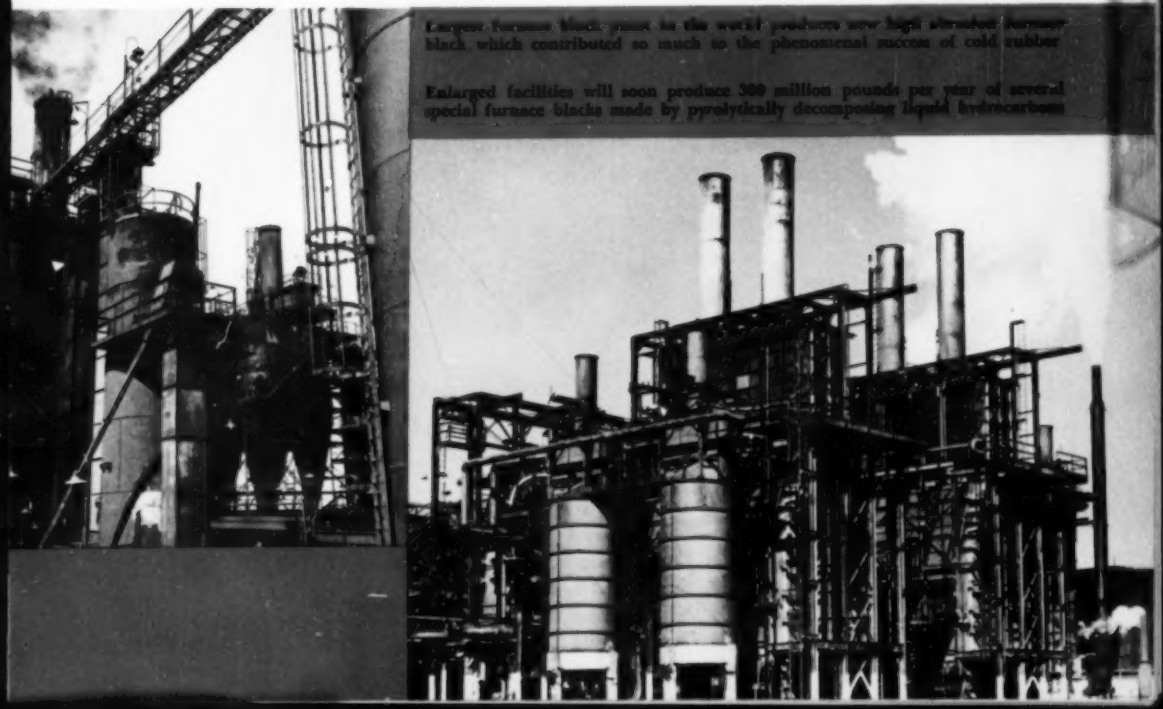
The oil feed is drawn from storage by proportioning pumps and fed through pre-heaters to horizontal, cylindrical, ceramic-lined reactors, enclosed in metal cases approximately 5 ft. in diameter and 15 ft. long. Fuel and air for supporting combustion are introduced into the reactors. At the extremely high temperatures thus attained, the oil is decomposed to yield principally carbon black and hydrogen. At the exit of the reactor the products of decomposition and combustion are quenched with water to stop further reaction. After passing through a long cooling pipe, the carbon black suspension enters a water-spray tower where the temperature is further reduced to about 500 deg. F. The gas stream then enters an electrostatic precipitator in which the black is agglomerated and part of it separates. The remainder is removed by cyclone separators or by bag filters.

Next the loose carbon black is put through micropulverizers to produce a light, fluffy, uniformly ground product with a bulk density of only about 3 lb. per cu. ft. To put this material into a form in which it can be readily packaged for commercial shipment, the loose black is fed into large rotating pellet mills. These produce small pellets, 250 to 1,000 microns in diameter, and increase the apparent density to 24 lb. per cu. ft. In this form the pellets can be readily stored prior to packaging into 25 and 50 lb. bags or conveying into covered hopper cars for bulk shipment.

TEN STEPS TOWARD BETTER RUBBER...

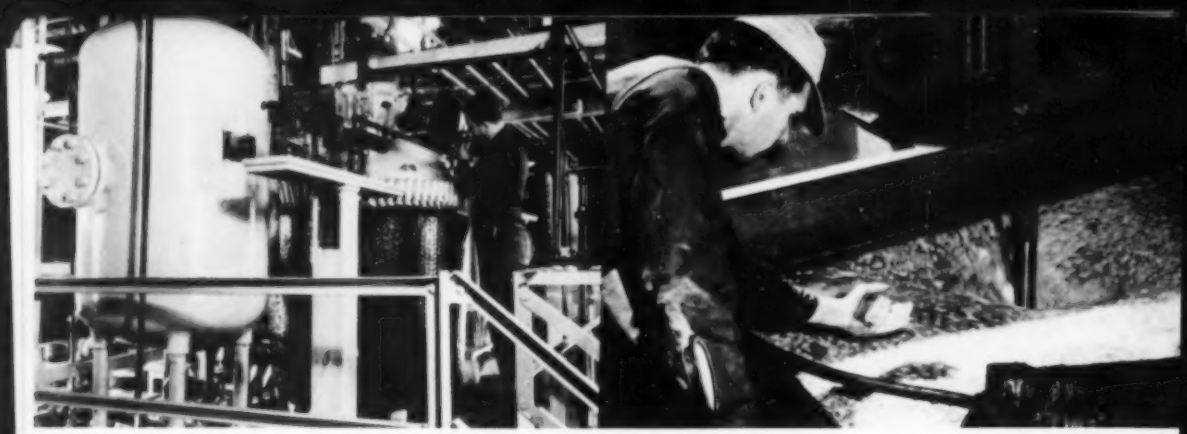
Cold rubber, as we know it today, is a butadiene-styrene polymer produced in an emulsion polymerization system at a temperature just above the freezing point of water. Prior to the advent of cold rubber, most emulsion polymers were produced at comparatively high temperatures — GR-S, for example, is made at 122 deg. F.

As far back as World War I, German experience had indicated



Largest furnace black plant in the world produces new high abrasion furnace black which contributed so much to the phenomenal success of cold rubber

Enlarged facilities will soon produce 300 million pounds per year of several special furnace blacks made by pyrolytically decomposing liquid hydrocarbons



Operator in first cold rubber pilot plant makes up experimental batch for polymerization at very low temperatures. **A steady stream of rubber "crumbs" flows from continuous copolymer coagulator to be screened, filtered and dried.**

that improved synthetic rubber was obtained with lower polymerization temperatures. But these early indications were mostly based on laboratory findings which often correlated poorly with the results of testing under actual service conditions. Moreover, the early polymerization systems required excessively long reaction times and gave products that were more difficult to process. Thus the whole history of the development of cold rubber became a search for faster and faster polymerization recipes.

In 1917 the Germans took four months to make their methyl rubber at room temperatures. The GR-S emulsion recipes produced rubber in 12 to 14 hours at 122 deg. F. but required 36 hours at 86 deg. F. Now, as a result of research in which many groups in government and industry participated, it is possible to produce better rubber at 41 deg. F. with only three hours reaction time.

To recount all of the research and development that contributed to the final success of cold rubber is beyond the scope of this article. But it is of interest to list, briefly, the results obtained in the program Phillips has pursued during the past ten years:

1. World's first completely refrigerated pilot plant for cold rubber was designed in 1942 and placed in operation in 1944.

2. The first pilot plant quantities of processable cold rubber were produced and supplied for factory and tire test programs.

3. Developed the "Custom" type polymerization recipe now most largely used for commercial production of 41 deg. F. cold rubber.

4. Produced the first pilot plant quantities of "anti-freeze" cold rubber at temperatures below freezing, in some cases as low as 0 deg. F.

5. First demonstrated that high quality tire treads could be made from a commercially feasible polybutadiene rubber.

6. Obtained and published chemical engineering data on heats of polymerization, heat transfer coefficients, heats of agitation, etc. for cold rubber production. Assisted in the first commercial production of cold rubber at Baton Rouge, La., Feb. 1948.

7. Introduced such organic initiators as the "fast" hydroperoxides which are rapidly replacing the original cumene hydroperoxide.

8. Combined cold rubber with high abrasion furnace black and in cooperation with tire manufacturers and Office of Rubber Reserve conducted first factory processing and road testing program.

9. Made important early contributions to the development of latex-masterbatched "oil extended" cold rubber.

10. Solved serious cooling problem and eliminated bottleneck in cold rubber production by inserting specially designed cooling coils directly into reactors. Heat of polymerization is thereby removed rapidly enough to cut cold rubber production cycles in half.

Production of cold rubber, in which Phillips participates on a large commercial scale through operation of the government-owned plant near Borger, Tex., has in-

PRODUCTION OF CARBON BLACKS IN U.S.

(Bureau of Mines Data)

Millions of Pounds

Year	Total Carbon Black	Total Furnace Black	Total Oil Furnace Black	Philblack A	Philblack O
1943	593	213	.04	.04	---
1944	802	387	18.7	18.7	---
1945	1,053	514	50.7	50.7	---
1946	1,244	625	77.7	77.7	---
1947	1,319	665	93.3	85.7	7.6
1948	1,298	621	181.0	92.5	33.9
1949	1,223	596	250.9	90.0	69.4
1950	1,381	765	370.9	94.1	85.7
*1951	1,645	1,010	516	100.0	110.0

*Estimated



The final step in the copolymer plant—hydraulic pressing of the cold rubber into convenient bales for shipment to tire manufacturers and other processors.

creased to a rate of over 300,000 long tons annually, over 40 percent of the current 760,000 long tons per year of GR-S production. This proportion is likely to increase to more than 75 percent of GR production, which is itself being further increased.

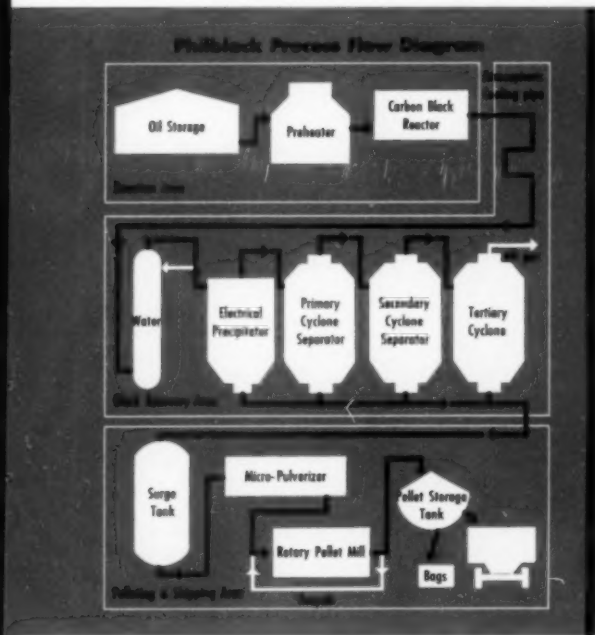
The final success of cold rubber is an excellent example of the importance of the application of chemical engineering to a new development and one strategically important to our national economy. That Phillips has no intention to rest on its laurels, however, is evident by its continued research which is already promising further improvements in quality and performance of this vital product.

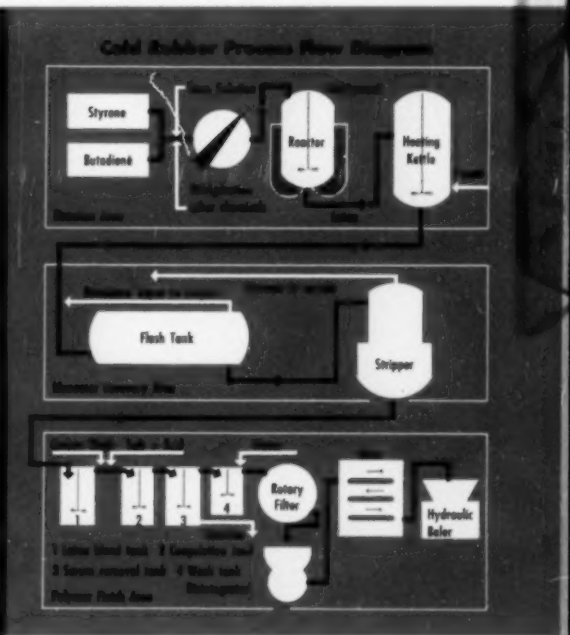
BEHIND THESE ACHIEVEMENTS...

Aggressive use of engineering and scientific skills has been an important factor in the growth of the Phillips Petroleum Co. Starting with 97 employees in 1917 and assets of about $3 million the company has grown to a $735 million corporation with 19,500 employees in 1951. Of nearly 2,000 technical employees, 28 percent are chemical engineers.

Phillips income is derived from a diversity of products. In 1950 these included more than 500 billion cubic feet of natural gas, 159 million gallons of aviation gasoline, 403 million gallons of natural gasoline, 180 million lb. of carbon black and proportionately large amounts of special fuels and lubricants. Eight refineries with a combined capacity of 182,000 bbl. per day, processed 57 million bbl. of oil in 1950. Its subsidiary, Phillips Chemical Co. produced 130,000 tons of anhydrous ammonia and converted a considerable portion of this into ammonium sulphate and ammonium nitrate.

To catalog all of the achievements of Phillips research during the past 25 years would require several fat volumes. Here are a few highlights: Entry into the refinery field in the early 20's began with a systematic development of liquefied





U. S. PRODUCTION OF GR-S TYPE SYNTHETIC RUBBER

Year	Production, Long Tons		Per Cent
	Total	Cold	Cold
1945	719,404	—	—
1946	613,408	—	—
1947	407,769	—	—
1948	393,880	10,000	2.6
1949	295,165	67,512	22.9
1950	358,248	134,963	37.7
1951 (Estimated)	710,000	270,000	38.0
1952 (Estimated)	780,000	470,000	60.0

petroleum gas, led to the first long-distance products pipelines for transporting motor fuels, butane and other liquefied gases. During the early 30's came the first plants to produce high-quality motor fuels by thermal polymerization of light hydrocarbons. Also during this period Phillips began the manufacture and sale of pure hydrocarbons for use in industry and research. In the late 30's there was further development of catalytic processes and their integration into refinery operations. New plants were installed for more complex petrochemicals — hydrocodimers, neohexane, butadiene and isoparaffins.

Identical test tires driven 24,222 miles with 20 percent overload at 60 miles per hour. Left—natural rubber-channel black. Right—cold rubber—HAF black.



Outbreak of the war found the company well qualified in many fields. The combination of its chemical engineering talents, capacity and raw material resources led to immediate assignments on aviation gasoline and synthetic rubber. New plants were designed, rushed to completion, and pushed into production. Among them: the first two of the nation's 26 hydrofluoric acid alkylation plants, two large butane isomerization plants, the first Cycloversion installation for fixed bed catalytic oil cracking, and also a catalytic ethylene-alkylation plant for high octane aviation fuel.

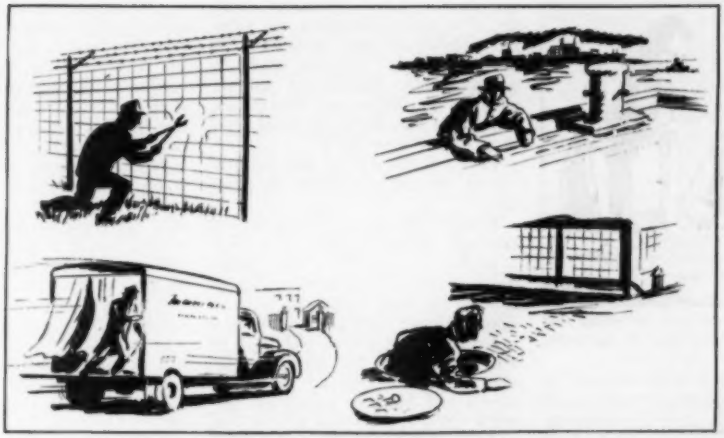
Of most significance in furthering the nation's synthetic rubber program were (1) the design, construction and operation of the great Plains plant for the manufacture of butadiene by the two-stage catalytic dehydrogenation of normal butane, together with its intermediate and final purification by furfural extractive distillation; (2) the commercial development of special oil-furnace blacks for rubber reinforcement; (3) the manufacture of tertiary mercaptans and other essential chemicals used in compounding synthetic rubber, and (4) the research and pilot plant developments that contributed to the successful commercial production of cold rubber.

Only an organization well grounded in science and engineering could have made so rapidly such significant contributions as the carbon black and cold rubber developments. They are the results of well coordinated teamwork among many men and women engaged in fundamental and applied research, in pilot plant development and evaluation of processes, in manufacturing and transportation, sales and technical services — all guided and directed by able management and administration.

Chemical engineers participated fully and effectively in every phase of these developments. More than a tenth of all Phillips employees are technically trained. Of these 556 or 28 per cent are chemical engineers.

The Research and Development Department, which includes the Chemical Engineering Division, began in 1925 with only 8 employees. Today it employs 784 men and women representing 41 states and 7 foreign countries and holding degrees from 190 different colleges and universities. Its 152 chemical engineers serve in all divisions of the department — in research and product and process development, market research and sales development, patents and licensing. But most are to be found in the Chemical Engineering Division which is charged with pilot plants, valuations and estimates, small scale or initial manufacturing operations, process design, special instruments, equipment and other engineering services. Even more chemical engineers, proportionately, are employed by the refining and gasoline departments and by the wholly owned subsidiary, Phillips Chemical Co., which operates the carbon black, synthetic rubber and petrochemical facilities as well as the plants for the manufacture of ammonia and its derivatives.

This, then, is the organization we honor with the 1951 Award for Chemical Engineering Achievement — "in recognition of its meritorious contribution to the advance of the industry and profession made possible through a broader participation of the chemical engineer in the affairs of the process industries."



An unpatrolled plant fence, an unguarded dock, careless inspection of incoming trucks, or even an unprotected plant sewer system may allow a saboteur to enter your plant undetected.

Plant Defense for Process Industries

II.—Espionage-Sabotage Control

JOHN F. ELICH

As Interviewed by Theodore R. Olive

NOTE—This is the second of two interviews with John F. Elich, of New York, consultant on plant security. The first, in October, dealt at length with practical methods of organization for disaster control in process plants. The more elusive problems of industrial espionage and sabotage are discussed here. As a former agent of the FBI, Mr. Elich engaged actively in the Bureau's plant security surveys during World War II. In his more recent consulting experience he has set up the security programs for a variety of industrial concerns, among them one of the largest chemical firms.—EDITOR.

Editor: Last month, Mr. Elich, you were extremely helpful in showing us how a process plant can analyze its disaster control problem, then set up and train an organization to cope with any sort of disaster. But we postponed an important part of the over-all problem of plant self-protection, namely, espionage-sabotage control.

J.F.E.: Yes, we did postpone it, but you recall we brought out the fact that certain parts of the disaster control organization are also concerned with the job of preventing espionage and sabotage.

Editor: I remember that. Under the plant security coordinator, who heads the entire protective organization, we have the guard service and the investigative unit. I'd guess they are the people involved in this problem.

J.F.E.: They are, with the very important additions of management and the personnel department. A little later we'll go into their functions.

Editor: First, let's get one thing straight. I recall that Director Hoover, of the FBI, stated definitely that there were no known cases of enemy-inspired industrial sabotage in this country during World War II. If that's the case, why should we be so seriously concerned about sabotage today?

J.F.E.: I think you already know the answer to that one, Mr. Editor, and I think the country knows it, too. But we can't drive it home too often. Today, we have a totally different and much more dangerous sort of enemy. International Communism has many of its disciples planted within our borders. Thousands are actual members of the Party and many thousand more are their dupes—the fellow travelers. Communism has been sold so thoroughly to the party liners that they live, eat, and sleep it. To them it's a religion and a way of life rolled into one. And many of them have infiltrated into industry and unions.

Editor: The FBI must know most of them—

J.F.E.: That's true, but it's likely that some are unknown. And it's obviously impossible to keep all of them under constant surveillance or put them where they can't do harm. This means that thorough education and eternal vigilance on the part of everybody in industry are our most important weapons for plant defense. By that I don't mean witch hunts. But I do mean a real awakening to the danger on everybody's part. Company bulletins and memos, talks by the top men, and especially indoctrination via the foremen are all part of this picture. Joe Doakes must be made to realize that he's an indispensable part of the ball team, that he and all the fellows who work with him are really auxiliary members of the guard service, and that anything suspicious he sees must be reported, no matter how trivial it seems.

Editor: I'm beginning to get the point. You're saying that no matter how important the regular anti-sabotage organization may be in a process plant, good personnel relations are even more important.

J.F.E.: Exactly. I mean a good job by the personnel department, but even more, I mean a good job by management in selling the company—and the country—to its employees. That selling job, as we all know, hasn't been done as well as it should be. Here in



Joe Doakes must be made to realize that he's an indispensable part of the team.

the United States we're inclined to take our great advantages pretty much for granted. Also, we're perpetually in a hurry so that often we simply don't take the time to remind ourselves and our employees of those advantages. And human nature being what it is, there is always the possibility of real or imagined sore spots in any situation which a smart operator, bent on subversion, can build up into trouble if given a chance.

Editor: So you mean that management has the responsibility for creating an atmosphere where subversion is psychologically unlikely?

J.F.E.: Just that, and it's close to the biggest responsibility that management has today. I don't intend to give the idea that a good relation between company and employees can convert the professional ideological spy or saboteur, but it can make his job difficult, if not impossible. On top of that, it can eliminate trouble from the ordinary malcontent and straighten out the thinking of most of the young "liberals" who have been confused by the party line. Such youngsters are usually idealists who have been sold a bill of goods. Most of them are ripe for conversion to our American way. Ignore them or give them a chance to believe in fancied wrongs, and you may have created a potential menace.

Editor: But what about employees with a mental quirk? There's always the chance of having a crack-pot or two on your payroll.

J.F.E.: That's true, but good relations will help to keep them in line, too, since they won't be able to influence other employees and any lone-wolf activities are not likely to go unnoticed.

Editor: Let's sum that up. We can assume that the great preponderance of all the people in industry are loyal both to country and to company. However, there's a small core of potential subversives: the party members and underground commies, some doubtless trained saboteurs; the natural malcontents and quarrelers; the downy "liberals," and the crackpots and screwballs. Sounds like quite an array to me! What can industry do, other than educate its personnel and shoot square with them?

J.F.E.: There is a lot that industry can do, but first let's analyze the problems.

Editor: You mean, espionage and sabotage? Which is more dangerous?

J.F.E.: In a way they are related, but as a general proposition sabotage is much the more dangerous. For one thing, so much information of use to a potential enemy is freely published in this country that the spy's job consists largely in clipping the newspapers and business magazines. Actually, there is not much left for him to ferret out except classified military information, individual plant capacities and operating rates, and points where sabotage or bombing would be most effective.

Editor: It looks to me as if the individual plant's job is to prevent the last two.

J.F.E.: Well, yes, but plants with government contracts have control of a certain amount of military information, too, and nearly all industrial information is of possible value to an enemy. There is also the very practical angle that a spy in your own plant may be pinpointing your plant's own critical spots for later sabotage.

Editor: Then, how control espionage?

J.F.E.: Let's point out first that a spy, like a saboteur, may be in your employ, or he may gain access from the outside. But a spy has still another method of attack—by pumping your loyal employees or their families. Employees must be taught to suspect the fellow who seems unduly curious, either inside the plant or outside. Inside the plant, we can set up all sorts of controls to limit the chance of espionage, including visitor controls, restricted areas, identification systems, special safeguarding for confidential information and, finally, loyalty checks. In addition, we can make certain about the number and routing of carbon copies and blueprints and can arrange to have used carbon paper, blueprints and scrap paper destroyed. People engaged in janitor and other plant housekeeping duties can be checked especially, since their opportunities for getting into confidential files are unique.

Editor: Isn't the loyalty check pretty much the key to the whole story of internal subversion?

J.F.E.: So far as it can go, it is. But don't forget that it's possible even for a professional investigator to miss occasionally in making a loyalty check. Important as it is, this tool isn't infallible, and with the limited facilities available to a plant personnel department, it's even less certain. One problem is the anti-discrimination laws now on the books in ten or a dozen states. These laws limit you considerably in the sorts of questions you can ask a prospective employee, but here's an important out: once you hire a man, you're at liberty to question him in additional ways that will help to uncover doubtful loyalty. To protect yourself fully, if you have government contracts you can submit the type of questionnaire you intend to use to the state anti-discrimination commission. It's easy to secure state cooperation when you've made it clear for what purpose the check is needed.

Editor: How do you feel about finger-printing? I understand the FBI has no facilities for wholesale checking of finger prints.

J.F.E.: That's correct, but fingerprinting of every employee is a powerful psychological deterrent to future trouble. You can't legally force a man to supply finger prints, but you'll seldom find one who will refuse, for fear of putting himself in a bad light. Furthermore, in complete honesty, you can sell it to him on the score of protection to himself—identification in case of a bad accident. If suspected subversion does occur, the FBI will be only too glad to check the prints of the suspect. Also, local and state police departments are ordinarily cooperative in the checking of prints. However, a word of caution: you've got to be discrete in using the information you may obtain from a check of prints. Otherwise, you may do irreparable harm to some completely loyal unfortunate who's trying to work down a police record. While we're on the subject of psychological deterrents, there's another powerful one.

Editor: What's that?

J.F.E.: The Espionage Act of June 14, 1940. Every plant with a government contract, and other plants that are important from a defense standpoint as well, ought to bring it to the attention of each new employee. Also to old employees if they haven't already seen it. The applicable part is Title 50 of Chapter IV, Sections 36 to 42. A memorandum containing this abstract should be read by each, after which he adds his signature—usually witnessed or even sworn to—to a statement that he has read the quoted portion of the Act and adheres to it.

Editor: What about checking with former employers before you take a man on?

J.F.E.: That's a useful tool in any event, and a must in the case of "sensitive" employees. Which brings up the very important point of employee records. Few concerns do an adequate job in that regard. One of the personnel department's principal jobs should be to maintain a full and detailed record on every employee. This would include not only the usual personal data, salary or wage records, and the signed Espionage statement, but also occasional pertinent comments from whatever source, so as to become a history of the man's attitudes, ability, loyalty, and value to the company. A periodic report from each employee's foreman or other immediate superior ought to be a regular feature of this record. The record ought to be kept for a reasonable time after employment termination.

Editor: I can see that. If I were personnel manager of the XYZ Corp., I'd find it might useful to be able to call A B Chemical and learn of applicant John Smith that he's a chronic complainer or that he's perennially in hock to the loan sharks.

J.F.E.: That's the idea. And you'd hesitate a long time in taking him on when he might stir up trouble out of sheer cussedness or might be approachable by a subversive agent because of his constant need for extra money. Your own records and those of your man's earlier employers are among your most important weapons in fighting potential espionage and sabotage.

Editor: You make it obvious. Now, let's assume that our process plant has a wide-awake and progressive management, a good personnel department, a careful employment policy, and a system of records such as you describe. What then? We've minimized certain possibilities, but we may have missed one or more potential saboteurs, and we've still to deal with the entrance of saboteurs from the outside.

J.F.E.: Well, part of your problem involves organization, and part of it protective equipment. Before we get down to details, let's take a hasty look at the kinds of sabotage we must watch out for. Enemy sabotage in industry attempts to decrease or stop essential production by interfering with labor, with raw material supplies, or with operations. It may take the form of labor sabotage, destruction of buildings and equipment by fire or explosion, damaging of important equipment mechanically, contaminating or spoiling the product, and bringing about injury to personnel.

Editor: Just what do you mean by labor sabotage?

J.F.E.: I'm glad you asked that question because labor sabotage is difficult to detect and may easily bear a close resemblance to a legitimate labor dispute. Labor sabotage can take many different forms. It may consist in stirring up strikes or slowdowns, in arousing resentment against the management, in forcing through unreasonable demands. It may result in inferior work or excessive spoilage. It may bring about unwarranted absenteeism, or it may simply provoke fear, unrest, and uneasiness.

Editor: How can management tell whether a labor saboteur is at work?

J.F.E.: If it's strictly honest with itself, I believe that management can judge pretty accurately whether a labor dispute has a more or less legitimate basis. That isn't the only test. Most labor unions—with a few exceptions that are well known to management—have done a pretty good job of ridding themselves of communist influences. The idea is to bring your top union members into the security set-up. They'll generally be intelligent men and as anxious to avert subversive influences as you are. When you've secured their cooperation on security measures by making them a part of the security team, you automatically have a check on labor sabotage—and you've avoided a potential source of friction from security measures that otherwise might seem arbitrary and tyrannical, or might be taken as spying on labor by the management. Also, you will have the cooperation of your top labor men if it comes to keeping a watch on some suspected individual.

Editor: A very good idea. If our loyal union men are pulling with us, the disloyal agitator shouldn't have much chance of starting trouble.

J.F.E.: Precisely—and his actions can easily come under suspicion. An example is the chronic fault-finder. Nothing is ever right with his working conditions. He won't listen to reason from his fellow workers and always wants to bypass the union steward and his foreman, taking his complaints direct to the management. Such a fellow is at least suspect. He is probably trying to slow-down or even stop production completely.

Editor: Would you say that every plant is in danger of sabotage?

J.F.E.: I wouldn't say so. Those plants that are essential for military and civilian supplies are the ones that need to be on their toes. Each plant management can judge pretty well how essential it is. If it's a little plant, and one of many making the same kind of product, it doesn't have much to fear. But if it's making, say, aviation gasoline, it had better watch out!

Editor: Plants with government contracts have to follow certain security procedures, don't they?—And aren't they checked for security by the Provost Marshal's Office?

J.F.E.: True. But you've probably been wondering how a similar check of weak spots can be made by plants without such contracts.

Editor: Yes, I have. Most process plants are, or should be, aware of the essential character of their business. How can they search out their own weak spots and correct them?

J.F.E.: That's one of the main jobs of the plant's security coordinator. One good way is for him, or another top official, to undertake a security survey by imagining every possible method he could use to sabotage the plant, or secure confidential information, if he were a subversive agent. Once he has located the weak spots, he can work out steps to correct them. A very important aid to such a self-survey is the survey form used by the Provost Marshal's Office. This form will be supplied if you have a defense contract. Although it's classified, it can probably be secured by other plants as well. Later there will also be a manual covering self-surveys. However, the Provost Marshal is often short of these forms so if a non-contract plant wants one it may have to borrow it.

Editor: What are the spots in a process plant that should receive particular attention in a security survey?

J.F.E.: Let's make it broader and say we've got to survey both spots and methods. The spots are the especially sensitive areas where sabotage damage would be easiest to bring about, or most difficult to repair. The methods are the ones you use to prevent entrance of a saboteur from outside the plant, or prevent an inside saboteur from causing damage.

Editor: All right, what about the spots?



Sabotage may take the form of destruction of buildings and equipment by fire.

J.F.E.: Plants will have to figure these out for themselves because the sensitive areas will vary with the plant and type of process. In general, look for bottlenecks and for equipment which is especially hard to replace. Areas with a fire or explosion hazard should be checked carefully. Since most process plants depend heavily on process steam and electric power, pay particular attention to the power plant, switchboard, and main distribution transformers. In this connection, consider a separate fence enclosure around the power plant and consider also the possibility of routing all incoming trucks away from the power plant on their way to Shipping and Receiving. This goes for other sensitive areas as well.

Editor: What about plants that buy power?

J.F.E.: If the plant buys all or part of its power, the power company's plant entrance transformers are especially vulnerable. You don't have to worry much about power lines, since they are easy to repair, but transformers are another story.

Editor: Would you say a plant ought to have spare transformers?

J.F.E.: I don't think that's necessary, although spares on a few of the most essential pieces of process equipment might be justified, particularly if they are sorts of equipment that have to be replaced at times anyway. I have suggested, and so have other security men, that a few replacement transformers ought to be stocked in large industrial areas by the power companies, so that they could be rushed wherever a transformer might be damaged by either bombing or sabotage.

Editor: That sounds practical. What about the survey of security methods?

J.F.E.: As we've already seen, the methods include employment techniques and loyalty checks, as well as personnel records and policies. When you're doing the best job you can in those matters, you've minimized the possibilities for infiltration by subversive elements, and for their stirring up trouble among your loyal employees. In addition, there are the methods of preventing unauthorized entrance into the plant, of limiting the movements of employees and visitors, and of guarding and patrolling the plant areas.



Patrol cars should have powerful searchlights, preferably also two-way radio.

Editor: Let's start with the preventing of unauthorized entrance.

J.F.E.: Alright, the first element here is the fence and the entrances. The fence should be a good one, naturally, but a fence doesn't mean much without a guard force since a saboteur can easily cut or climb it if he has time to do so unobserved. There should be as few entrances as possible, with employee and visitor parking on the outside. Trucks ordinarily should enter and be checked carefully at the main gate, where employees and visitors on foot, and any packages they carry, are also checked by the guards. The railroad entrance should be kept locked, except when guards are on duty to admit or release cars. The guards should inspect empty cars and examine the seals on loaded ones. If the company is on the waterfront, dock patrol is especially necessary.

Editor: How about yard lighting, guard towers, and photoelectric intrusion alarms?

J.F.E.: Floodlighting is very desirable, but alarms and guard towers are likely to fail just when you need them most. In a heavy snowstorm or fog, a guard tower is no substitute for a guard patrolling the fence on foot or in a patrol car. As for photoelectric alarms, the problem is to prevent false alarms from animals or from fog, snow, dirt, or scrap paper that may blow across the light source. Too much reliance on such things is as bad as trusting to a Maginot Line. It is much better to put complete responsibility on the fence patrol. This patrol should consist of one or possibly two men to inspect every part of the fence—and I mean really inspect it—at least once each eight hours. The inspection should be at irregular intervals and the guards should look particularly for attempts at entrance, such as loosened bolts at the corner posts. If they make the patrol in a car at a large plant, it should be equipped with two powerful spotlights. It's a good idea, too, to have the patrol car equipped with two-way radio as part of the emergency communications system we discussed last month.

Editor: Isn't that pretty expensive, and doesn't it require concurrence of the FCC?



The best system is the one where the badge is picked up from the gate guard.

J.F.E.: Not too expensive. A small plant can set up a radio system for as little as $2,500, while a larger set-up with six or seven stations would come to about $5,000. You do have to have FCC clearance and an assigned wave length.

Editor: Now let's discuss the control of entrance to the plant.

J.F.E.: Normally, the control will be a badge system for employees, and a pass system for visitors. Badges have improved a lot in recent years and the laminated type now used extensively is virtually impossible to alter without destruction. It is also difficult to counterfeit. A badge ordinarily contains the employee's photograph, clock number, name, and brief description. The best system is the one where the badge is left at the gate at the end of the shift, then picked up from the gate guard the next time the employee comes on duty. During the rush it may be difficult for the guards to compare every man with his badge photo. However, if the guards spot a face they don't recognize, the man will be stopped until the identification has been made.

Editor: Why can't a man take his badge home?

J.F.E.: Well, for several reasons, including the possibility of tampering or counterfeiting. Badges are often lost, too. If lost, careful record should be kept. To minimize losses, some plants levy a fine of a dollar or so which is paid into a fund for some employee use, such as the annual picnic.

Editor: How do you suggest using a badge system to limit movement in the plant?

J.F.E.: If that's necessary you can use identifying colors for different departments. This will quickly spot anyone who is in an unauthorized area. A special pass must be issued to anyone—say, an engineer or maintenance man—who has to go into other areas

on occasion. Or, certain personnel can have a color good anywhere.

Editor: How about visitors?

J.F.E.: Only on proper identification the visitor is given a pass to the individual he is to see. Then he is escorted to that person's department. Nobody, not even a presumed officer of the law, is allowed within the gate without proper identification.

Editor: Is there such a thing as a foolproof badge system?

J.F.E.: There is. It's somewhat cumbersome, but it really works. The idea is to have two badges for each employee—an entrance badge and a work badge. Each man picks up his entrance badge at the gate and goes to his work place where he exchanges the entrance badge for the work badge. After a suitable time, the foreman checks the work badges still not in use and phones the gate to find out if corresponding entrance badges have been issued. This establishes whether the missing men have entered the plant or whether they may be absent. At the end of the shift, the process is reversed. If there are any missing entrance badges, the gate guards phone the foreman who, if he's holding any of his men for overtime, should already have notified the gate of that fact, telling the guards what time the men will leave.

Editor: That puts a good deal of responsibility on the foremen.

J.F.E.: It does, but your foremen or other production supervisors are key men in the whole situation. As members of the supervisory group directly in contact with the workers, they know and can appraise their men, and can spot an interloper. Since they are the means of putting many management policies into effect, they have a great influence on morale and on the employee's attitude toward his job and the management. Their responsibility for security is at least as great as that of the guards. In fact, they ought to be taught to consider themselves as auxiliaries of the guard force.



If you want alert guards . . . you can't rely on your over-age pensioners.

Editor: How do you set up a guard force and what are a guard's duties?

J.F.E.: In a small plant there may not be a full-time guard unit, in which case certain individuals may be assigned special guard duties. Or, the guards may be given light operating duties they can handle during their rounds. Ordinarily, however, a plant will use regular guards. In guard duty, as in everything else, you get what you pay for and if you want alert, intelligent guards who can handle an emergency you can't rely on your over-age pensioners. The number of guards, of course, will depend on the size of your plant, the length of fence to be patrolled, size of labor force, and the number of entrances to be guarded. All guards should be trained to handle any of the several kinds of guard duty, as well as emergency duties during disasters, as we noted last month. Preparation of a manual on guard duties by the security department is a very essential activity, especially in the larger plants.

Editor: In making the clock rounds, I assume that the itinerary should be varied so that a saboteur will be unable to estimate when the next visit will be made?

J.F.E.: That's correct. Your insurance company will require one inspection each hour, but the order of calls at the various stations should be varied irregularly in a manner known only to the guard captain. And in this connection, one of the duties of all guards should be to make regular written reports of all occurrences during the duty tours. This practice develops alertness and may turn up valuable information.

Editor: Is there any good way of keeping your guards on their toes—making sure they will always be alert?

J.F.E.: Yes, there's a procedure for this which was used successfully by the FBI during its World War II security surveys. Agents often gained access to a plant without detection, simply to impress on the management that its security system was weak. I've gone through the fence and I've entered unchallenged with incoming trucks. One agent went through a sewer and up through a manhole. It's possible to go over the fence, too, but I don't recommend that method since some zealous citizen is likely to shoot first and ask questions later. I do recommend that the guards be told that certain attempts will be made from time to time to enter the plant without detection, and to penetrate to various vulnerable spots. They should understand that this is being done in order to learn how a saboteur might do it. This would be carried out by a member of the security department who would leave evidence of his visit at several places he reached undetected. Detection, however, would be cause for commendation of the guards. Incidentally, here's where you can give a boost to the security education of your entire working force. Everyone in the plant needs to be inculcated with a sense of security responsibility, and everybody can be urged to be on the alert for the infiltration tests. Each man should be made to feel that whenever he encounters an unauthorized person he should report it immediately to his superior or to the security department.



Whenever he encounters an unauthorized person, he should report it immediately.

Editor: How does the investigative unit you mentioned earlier fit into all this?

J.F.E.: Actually, it functions only if a security regulation is violated, or something happens that needs investigation. Then, its principal job is to secure first hand information immediately after the happening. If the security department becomes suspicious of any individual, or any happening, such as a slowdown, this should be reported immediately to the FBI, since the evaluation of suspicious happenings is not a job for amateurs. The FBI may or may not make an immediate investigation, depending on circumstances, but it should always be given an opportunity to do so. Whenever any evidence of sabotage is uncovered, even though it seems relatively minor or points to no individual, the FBI should always be informed.

Acknowledgment: The editors are deeply grateful to Mr. Elich for his willing cooperation. Thanks are due also to S. A. Anthony, Jr., president of Civil Defense Research Associates, Inc., for his helpful suggestions during this interview of Mr. Elich.

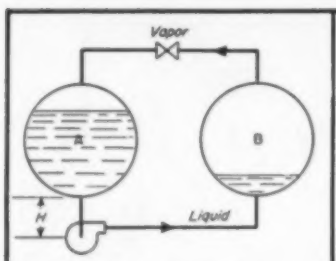


Fig. 1 – Liquid pumping with vapor line

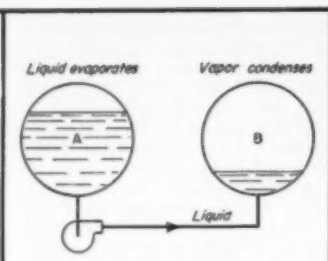


Fig. 2 – Liquid pumping without vapor line

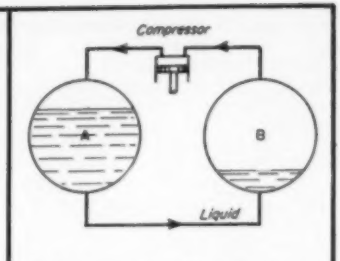


Fig. 3 – Vapor pumping with compressor

How to Transfer Volatile Liquids Under Pressure

Do you know what happens if you (1) use a vapor line; (2) don't use a vapor line; (3) use a vapor compressor for (a) transferring liquid or (b) stripping vapors? This article explains.

R. J. SWEENEY

It is common practice in the process industries to store and transport materials which are normally gaseous in the form of a liquid confined under the pressure of its vapor. The advantage in space saving is obvious from a consideration of the relative liquid and gaseous densities. The conditions making liquefaction advantageous include: (1) Critical temperature above the ambient; (2) reasonable vapor pressure at the ambient temperature; and (3) normal boiling point less than the ambient. A few representative chemicals which fall in this classification are listed in the accompanying table, in the order of increasing vapor pressure at 86 deg. F. (30 deg. C.).

Materials with low vapor pressure are handled in open containers unless contamination with air is objectionable. Materials with very high vapor pressures or low critical temperatures are handled as compressed gas, without liquefaction.

Many of these products are shipped as liquid in pressure vessels such as portable cylinders, tank cars, trucks and trailers. The tank must not be filled completely, since a free liquid-vapor surface is necessary to limit the pressure. The Interstate Commerce Commission and other regulatory bodies have rules intended to prevent over-filling. The amount of liquid charged should be such that maximum thermal expansion will not fill the vapor space. If this happens, excessive pressure will be developed by the thermal expansion of the liquid, resulting in blowing the relief valve or rupture of the vessel. In some cases, tank cars have to be insulated to avoid rapid changes in pressure.

Usually these products are stored in pressure vessels, designed for a working pressure corresponding to the maximum expected temperature. It is also possible to use light vented storage tanks if the product is refrigerated to a temperature below the atmospheric boiling point.

R. J. SWEENEY *is a member of the engineering department of Air Products, Inc., at Emmaus, Pa.*

LIQUID TRANSFER

Interesting problems arise in filling and emptying tanks containing volatile liquids, because the vessel contains saturated liquid and vapor in equilibrium. The same difficulties arise as in the flow of boiling water.

A simple case of transfer by liquid pumping is shown in Fig. 1. Here the pump is taking suction from vessel *A* and delivering liquid to vessel *B*. The vapor displaced from *B* as the liquid enters flows back to *A* through a vapor equalizing line to replace the volume of liquid leaving *A*. The head which the pump must supply is the maximum difference in liquid level between *A* and *B*, plus the frictional losses in the liquid piping, plus the frictional losses in the vapor equalizing line. To avoid cavitation, the pump must be at an elevation *H* below the bottom of the suction tank. The value of *H* must be at least equal to the net positive suction head requirement of the pump, plus the fric-

NOMENCLATURE (Consistent units)

a, b, c	Constants.
c_p	Specific heat at constant pressure.
c_v	Specific heat at constant volume.
C_i	Constant of integration.
h	Enthalpy.
i	Internal energy.
k	Slip pressure, a constant depending on compressor design and compression ratio.
p	Absolute pressure.
Q	Volume flow rate.
r	Compression ratio.
t	Temperature.
v	Specific volume.
V	Volume of vessel.
VE	Volumetric efficiency.
λ	Latent heat of evaporation.
ρ_l	Density of liquid.
ρ_v	Density of vapor.
τ	Time.

Properties of a Few Volatile Chemicals Commonly Handled as Liquids.

Formula	Chemical	Vapor Pressure, Psig. at 86 Deg. F.	Critical Temp., Deg. F.	Normal Boiling Point, Deg. F.	Formula	Chemical	Vapor Pressure, Psig. at 86 Deg. F.	Critical Temp., Deg. F.	Normal Boiling Point, Deg. F.
$C_2Cl_3F_3$	Freon-113	13.9*	417	118	CH_3NH_2	Methylamine	63	314	20
CH_2Cl_2	Methylene chloride	8.4*	421	104	SO_2	Sulphur dioxide	52	315	14
C_2H_5OH	Ethyl ether	4.9*	522	94	C_4H_{10}	Iso-butane	45	273	10
$C_2H_4O_2$	Methyl formate	1.8*	418	89	CH_3Cl	Methyl chloride	80	289	−11
CCl_3F	Freon-11	3.6	388	75	CCl_2F_2	Freon-12	93	233	−22
$C_2H_5NH_2$	Ethylamine	10.3	362	62	Cl	Chlorine	114	291	−30
C_2H_5Cl	Ethyl chloride	12.4	369	54	NH_3	Ammonia	154	271	−28
$CHCl_2F$	Freon-21	16.5	353	48	$CHClF_2$	Freon-22	160	205	−41
$C_2Cl_2F_4$	Freon-114	22	294	38	C_3H_8	Propane	140	202	−44
C_4H_{10}	Butane	27	306	31	C_3H_6	Propylene	167	196	−54
					H_2S	Hydrogen sulphide	318	213	−75
					C_2H_6	Ethane	601	90	−278

* Vacuum, inches Hg.

tional losses in the suction piping. Failure to satisfy the cavitation criterion will result in reduced capacity, excessive noise and possible pitting of the pump parts.

If it is not possible or convenient to provide the vapor equalizing line the problem becomes complicated. This is normally the case when the product is being pumped to process rather than to another vessel. In this case (Fig. 2), vapor is evolved from the liquid to fill the expanding vapor space. This vapor must be provided with latent heat of vaporization at the expense of the sensible heat of the remaining liquid, neglecting any heat flow through the tank wall. The heat balance between vapor and liquid is:

$$\frac{d\,V}{d\,\tau}\,\rho_g\,\lambda = V\,\rho_f\,C_{pf}\,\frac{d\,t}{d\tau} \qquad (1)$$

We can cancel out the differential time and separate variables to get:

$$\frac{d\,V}{V} = \frac{\rho_f\,C_{pf}}{\rho_g\,\lambda}\,d\,t = f\,(t)\,dt \qquad (2)$$

The right hand side contains thermodynamic properties of the material, which are pure temperature functions, so that their combination $f(t)$ is also a temperature function, which can be evaluated from a table of properties. The differential equation can be integrated to

$$\ln V = C_1 + F\,(t) \qquad (3)$$

If $f(t)$ can be adequately described by a simple analytic function, then the solution is analytic. However, if this can not be easily done, the integration can always be accomplished graphically. The constant of integration is obtained from the conditions at the start of pumping, namely, $V = V_o$ when $t = t_o$ or

$$\ln V_0 = C_1 + F\,(t_0) \qquad (4)$$

Subtracting this from the general expression, we get

$$\ln \frac{V}{V_0} = F\,(t) - F\,(t_0) \qquad (5)$$

The thermodynamic function $f(t) = \rho_f C_{pf}/\rho_g\lambda$ for ammonia is presented graphically in Fig. 4. From the general shape of the curve it appears that a quadratic polynomial of the form $f(t) = a + bt + ct^2$ should adequately express the function between 0 and 60 deg. F.

For ammonia

$$f\,(t) = 0.716 - 1.367\,(t/100) + 0.934\,(t/100)^2 \qquad (6)$$

which integrates to

$$F\,(t) = 71.6\,(t/100) - 68.4\,(t/100)^2 + 31.1\,(t/100)^3 \qquad (7)$$

The value of $[F(t) - F(60)]$ is also plotted on Fig. 4 for conditions subsequent to an initial temperature of 60 deg. F. From this we can calculate values of V/V_o as a function of temperature and, by inversion, the temperature as a function of remaining volume.

It will be noted that the process is characterized by a small initial rate of temperature fall which rapidly accelerates when the tank is nearly empty. Assuming the flow is produced by a

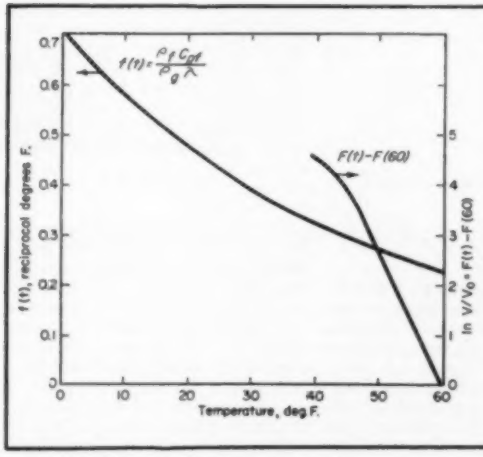


Fig. 4—Thermodynamic functions of ammonia.

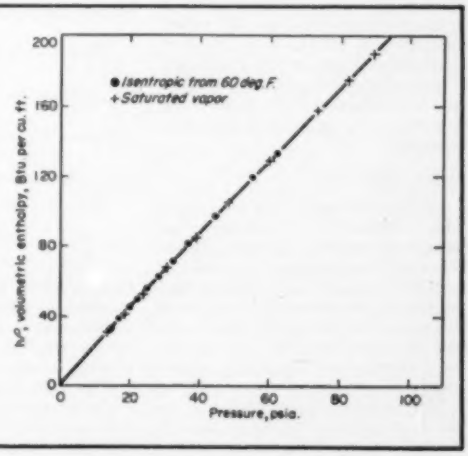


Fig. 5—Volumetric enthalpy of ammonia.

positive displacement pump at constant volume per minute, the temperature and pressure history can be described. The interesting feature is the rapid drop in temperature and pressure near the end of the pumping operation. This has the effect of increasing the output of the tank because of the reduced density of the remaining saturated vapor.

Conversely, when liquid is pumped into a closed tank containing vapor, the temperature and pressure will rise due to the condensation of vapor which will transfer latent heat of the vapor to sensible heat of the liquid. The rise will be rapid as filling starts, but will taper off as the volume of liquid increases.

Referring back to Fig. 2, if liquid is being transferred from vessel *A* to vessel *B*, the first liquid in *B* will cause a rapid rise in temperature. As the transfer proceeds, colder liquid will come from *A*, reducing the temperature in *B*. At the end of the operation, the temperature in *B* will be only slightly greater than the original temperature of *A*.

VAPOR TRANSFER

An alternate method of transfer is shown in Fig. 3. Here a vapor compressor takes vapor from *B* and transfers it to the vapor space of *A*. The pressure in *A* is thus raised above the pressure in *B*, so that liquid will flow from *A* to *B*. The total head producing liquid flow is the difference in vapor pressure between the two vessels, produced by the compressor, plus the difference in liquid levels. This scheme may be useful when it is not possible to place a pump low enough to avoid cavitation. The theoretical power requirement is exactly the same as for liquid pumping with a vapor equalizing line, since the energy dissipation in both cases is the sum of frictional losses in the liquid and vapor piping. The only actual difference would be due to the relative efficiencies of the pump and the vapor compressor.

VAPOR STRIPPING

With either method of emptying a tank, a substantial amount of product remains in the form of vapor. When the vessel in question is a tank car or other transport vehicle, the pay-load per trip can be increased by removing this vapor. A compressor can be used to suck vapor from the car, reducing its pressure down to nearly atmospheric.

The enthalpy of the outflowing vapor stream is equal to the decrease in internal energy of the vapor content of the tank, in the absence of work and neglecting heat transfer from the tank wall.

$$h\,\rho_g Q = -V\frac{d\,(\rho_g i)}{d\tau} \qquad (8)$$

When we substitute $i = h - p/\rho_g$ this reduces to

$$\frac{d\,(h\,\rho_g)}{d\tau} - \frac{d\,\rho}{d\tau} = -\,(h\,\rho_g)\frac{Q}{V} \qquad (9)$$

Now $h\rho_g$, the enthalpy per cubic foot, is a function of pressure along the process line of expansion of the tank vapor. The expansion is theoretically isentropic, starting from saturated vapor. This will result in partial condensation, which will rain down and collect in the bottom of the tank.

To increase speed of the stripping operation, it would be desirable to remove this liquid as fast as it collects, along with the vapor. Therefore, the vapor withdrawal should be through a bottom connection or through the liquid eduction pipes extending to the bottom of the tank car.

Since the temperature of the vapor is falling during the stripping, the tank wall is warmer than the liquid formed, so that the liquid falling on the wall will be at least partly re-evaporated. The enthalpy per cubic foot as a function of pressure is plotted on Fig. 5, for two cases: first, for saturated vapor and, second, for an isentropic expansion started from saturation at 60 deg. F. It will be seen that the results are nearly identical, so the question of the actual state of the vapor is academic.

As a first approximation, the volumetric enthalpy can be represented as a linear function of pressure, $h\rho_g = 1.92\ p$. Substituting this value in Eq. (9) we obtain an expression in pressure only:

$$\frac{d\,p}{p} = -\,2.09\frac{Q}{V}\,d\tau \qquad (10)$$

which integrates to

$$\ln p = -\,2.09\frac{Q}{V}\,\tau + C_1 \qquad (11)$$

Now when $\tau = 0$, $p = p_o$ and $\ln p_o = C_1$. Subtracting:

$$\ln\frac{p_o}{p} = 2.09\frac{Q}{V}\,\tau \qquad (12)$$

from which we can calculate the time required to reduce the pressure to any desired value p, for a constant compressor suction flow of Q cfm. out of a vessel of volume of V cu. ft.

This expression is in the same form as for the case of gas evacuation from a closed vessel. In the isothermal gas case, the numerical coefficient is 1.0, while for the adiabatic gas case, the coefficient is c_p/c_v, the ratio of specific heats.

TANK CAR UNLOADING

These considerations can be applied to the problem of unloading tank cars and transferring the product to liquid pressure storage. Tank cars are commonly fitted with excess-flow check valves which will close when the outflow exceeds a definite limit. This device is intended to operate in case of accidental disconnection or failure of the discharge hose or piping. A common size of tank car has a volume of 10,000 gal., and is fitted with two liquid eduction tubes, extending to the bottom of the tank, as well as excess-flow check valves designed to close at about 100 gpm. each.

We will assume that the pump has a capacity of 100 gpm. which will correspond to a safe flow of 50 gpm. through each excess-flow valve. The temperature as received is 60 deg. F., and the car is 90 percent filled with liquid ammonia. The total cargo consists of 9,000 gal. of liquid and 1,000 gal. of vapor. The liquid weighs 46,300 lb. and the vapor 50 lb.

At 100 gpm. the suction loss is about 17 ft., which is largely in the excess-flow valves. If the pump is located 20 ft. below the bottom of the tank car, this leaves 3 ft. for the pump as net positive suction head. If the pump cannot be lowered to this level, then the flow rate must be reduced to avoid cavitation. For instance, if only 5 ft. suction head is available, then the flow rate must be reduced to 50 gpm. The liquid entering the eduction pipe suffers a drop in pressure due to the static lift, velocity head and friction losses. Since the enthalpy is constant and the liquid is initially saturated, some of the liquid must flash to vapor in the rising leg. If the subsequent drop to the pump is sufficient this vapor will be compressed and condensed before it reaches the pump suction. However, while the vapor is present, the velocity of flow and the friction loss will be substantially greater than would be calculated for solid liquid.

At 100 gpm. liquid flow through the pump, the removal of 9,000 gal. of liquid will require approximately 90 min. The last liquid will leave the car at about 40 deg. F., and the car will then be full of vapor at the same temperature. Furthermore, it is certain that the liquid column will break before all of the liquid is out of the car. The siphon will be broken and the pump will lose suction. This remaining liquid can be removed by the vapor stripping compressor.

The weight of vapor at 3.971 cu. ft. per lb. is 337 lb. The speed of stripping also is limited by the excess-flow valves. For equal pressure drop, the volumetric flow is in proportion to the square root of the specific volume. Therefore, the compressor flow should be the pump flow times the square root of the ratio of vapor volume at 40 deg. F. to liquid volume at 60 deg. F., or $Q_c = 100$ gpm. $\times$ $(3.971/0.0260)^{1/2} = 404$ gpm. or 54 cfm.

EFFECT OF VOLUMETRIC EFFICIENCY

The compression ratio from 40 to 86 deg. F. is 73.32/168.7 = 2.31, and if we pull the pressure down to atmospheric, the final compression ratio is 168.7/14.7 = 11.5. The volumetric efficiency of a refrigeration-type compressor usually falls off linearly with increase in compression, the loss in one case being 3.25 percent per unit pressure ratio. Hence, for a ratio of 11.5:

$$VE = 1 - 0.0325\,r$$
$$= 1 - \frac{0.0325 \times 168.7}{p}$$
$$= 1 - \frac{5.5}{p} \qquad (13)$$

where 5.5 = k, the slip pressure.

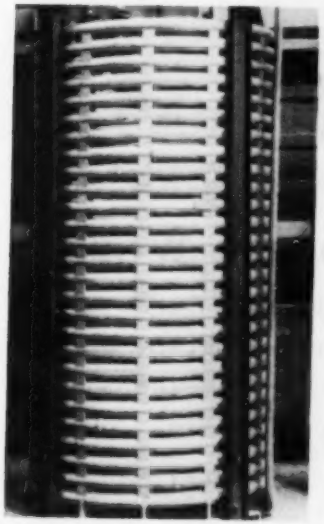
At the start of stripping $VE = 1 - (5.5/73.32) = 92.5$ percent, so that the required displacement is 54.0/0.925 = 58.4 cfm. = Q_o. At the end of stripping VE will fall to $1 - (5.5/14.7) = 63$ percent and the flow rate to 58.4 $\times$ 0.63 = 36.8 cfm. To convert Eq. (12) into a form which allows for variable volumetric efficiency, we can substitute the value $Q = Q_o(1 - k/p)$ into Eq. (10), and integrate, which gives:

$$\ln \frac{p_0 - k}{p - k} = 2.09 \frac{Q_0}{V} \tau \qquad (14)$$

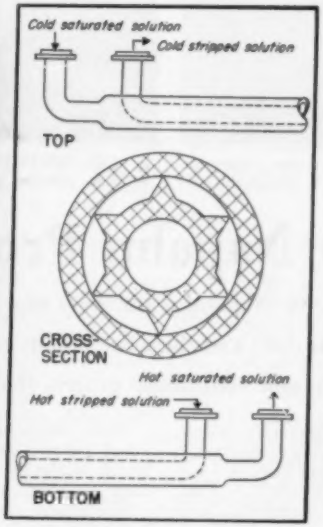
which, as with Eq. (12), can be solved for the time to pump down a vessel of V cu. ft. with a compressor of displacement Q_o cfm. and a slip pressure of k. Using numerical values, $\tau = [1{,}337/(2.09 \times 58.4)] \times \ln [(73.32 - 5.5)/(14.7 - 5.5)] = 22$ min.

The weight of vapor in the car at atmospheric pressure is 74 lb. which compares with 337 lb. at 40 deg. F., 485 lb. at 60 deg. F. and 942 lb. at 100 deg. F. This difference represents additional product shipped per tank car trip, for the same loading and freight charge. This saving, of course, is substantially greater if we take account of the indeterminate amount of liquid left in the car when the pump loses suction.

It is desirable to condense the discharge from the vapor compressor and return the condensate to the pump circuit to permit metering the total liquid received through the same meter. Before liquid passes through the meter, it should be either subcooled or compressed by the pump to avoid flashing in the meter due to its pressure loss.



Exterior view of heat exchanger.



How heat exchanger is constructed.

Something New in Heat Exchangers

The latest and most unique method of refining impure sulphur dioxide is credited to research engineers of the American Smelting and Refining Co. Commercial operation is now under way by ASR at Selby, Calif. and Tennessee Copper at Copperhill, Tenn.

This process is particularly interesting because of the novel heat exchangers used. They consists of two lead coils, one within the other, as illustrated. The exterior of the inner pipe has been extruded in the shape of a six-pointed star to provide support and also to retain concentricity.

The larger pipe has an inside diameter of 2 in. with a ¼ in. wall thickness and is made of 6 percent antimonial lead. The inside pipe made of chemical lead is 1 in. in diameter with a wall thickness a little less than ¼ in. at the thinnest section. The pipes were designed so that the area between them is approximately equal to the cross-sectional area of the inner pipe.

After extrusion, the smaller pipe is inserted into the larger and both are coiled into units 11 ft. in circumference and 27 coils high (about 7 ft.). Three hundred feet of pipe are used in each coil, and each coil weighs about 5,000 lb.

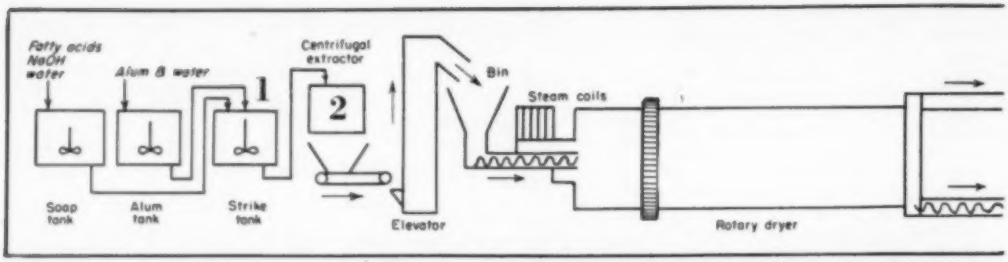
PLACE IN PROCESS

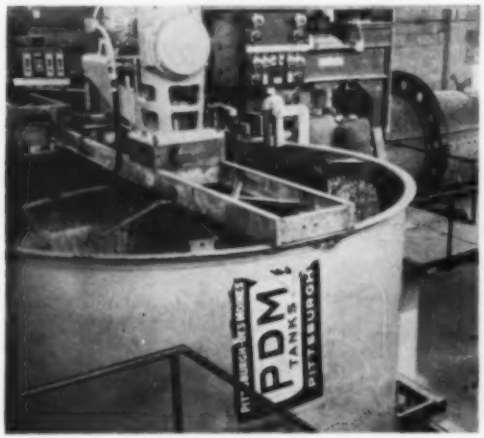
Sulphur dioxide must be at least 99.997 percent pure for such important uses as an antichlor in bleaching, refrigerant, solvent in petroleum refining, and disinfectant.

Purification depends on the absorption of impure SO_2 in cold, liquid dimethylaniline (DMA), and subsequent release of pure SO_2 upon heating.

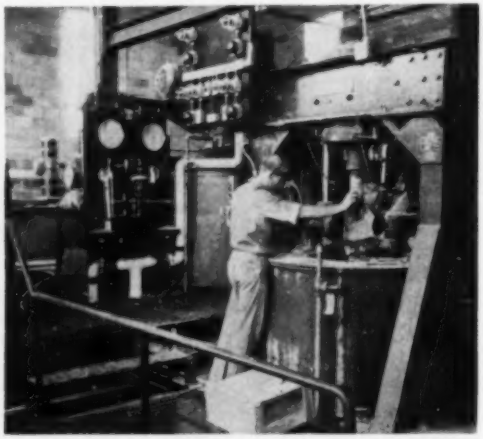
Saturated DMA containing 15 percent by weight SO_2 enters the heat exchangers at 86 deg. F. and leaves at about 175 deg. F. Stripped DMA enters at about 198 deg. F. and leaves about 110 deg. F.

Because of the corrosive nature of DMA in combination with SO_2, the major portion of the processing equipment which comes into direct contact is made of lead. The absorption tower is lead with steel framework for support. Bubble caps and supporting shelves are made of antimonial lead. The steel stripping tower has a bonded lead lining. This type of lining is necessary because of the higher temperatures in this tower.





1 STRIKE TANK with its agitator in action, makes the napalm. Centrifuge and rotary dryer can be seen in the rear.



2 CENTRIFUGE with its control board, alarm lights and bells, dewaters the slimy napalm after the strike is made.

How the New Napalm Process Works

Napalm is the goop that jellies gasoline. As such it is mighty important to GI's and their fire bombs and flame throwers. Here's the lowdown on the new continuous process that cuts the cost by 59 percent.

A new napalm plant went into operation in August. Owned and run by the Ferro Chemical Corp., Cleveland, it has a rated capacity on an around-the-clock basis of 1 million pounds per month (*Chem. Eng.*, Oct. 1951, p. 230). The $300,000 plant only requires a labor force of 12 (three to a shift and a supervisor).

Operation throughout is continuous and automatically controlled. Ferro engineers have adapted more or less standard plant equipment to an in-line mass production system that is regulated by an electrical control system.

Acid raw materials—oleic, naphthenic and coconut fatty acids—are stored in 15,000-gal. tanks. The oleic and coconut fatty acid tanks are housed in a storage room where the temperature is held at 100 deg. F. Naphthenic acid is stored in a tank outside the plant proper.

Sodium soap is made in two processing tanks inside the plant. Fatty acid, caustic soda and water are added to the tanks, and mixed to obtain the soap. The fatty acids are piped in from the storage tanks through metering machines. Caustic soda is poured in by use of a tilt hoist, and water is electrically metered in.

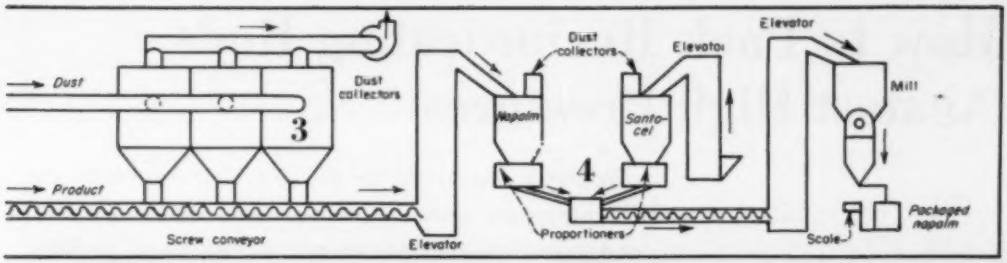
Alum solution is made in two other processing tanks, which are lead-lined. Dry alum, poured from steel containers by the use of a tilt hoist, and electrically metered water are introduced into the tanks and mixed.

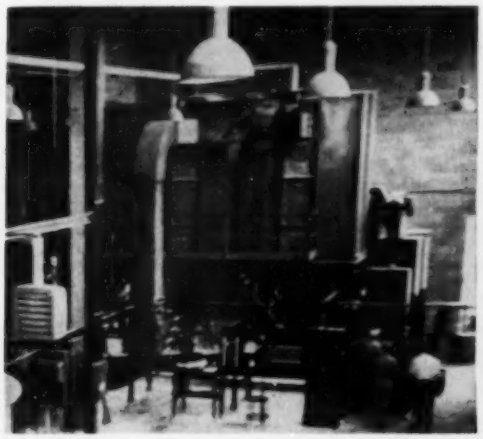
The napalm strike takes place in two other tanks with turbine tank agitators. Sodium soap and alum solution are metered into the strike tanks. The napalm strike (the precipitated aluminum salts of the fatty acids) is obtained after 1-hr. agitation. Correct temperature in all tanks is maintained by temperature recording controllers. They automatically operate steam coils lining the tanks.

From the napalm tank, the strike is pumped to a centrifugal extractor. Here the water content of the napalm is reduced to about 35 percent. Free-flowing napalm drops to the bottom of the centrifuge and onto a vibrating feed. It is shuffled into a bucket elevator, carried to an elevated bin whose outlet is connected to a rotary dryer.

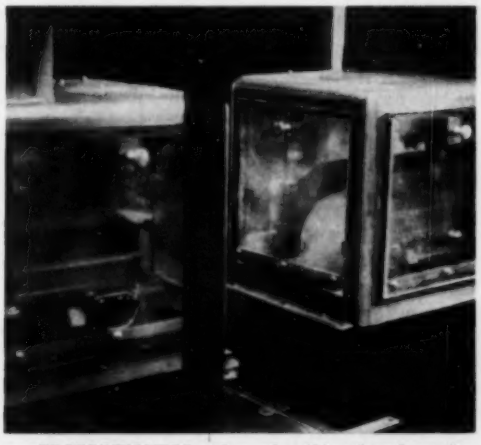
In the dryer the napalm is drawn with 320-deg. air through steam heated coils. A suction fan at the expelling end of the dryer draws the air.

The rotary dryer, which is constructed on a slight slant





3 **DUST COLLECTORS receive napalm particles from the dryer. A warm air stream blows the dust through the ducts.**



4 **PROPORTIONERS with napalm sifting through one box and Santocel through the other make sure blend is right.**

to aid in moving the napalm through it, is equipped with spirals that toss the napalm about, continually exposing it to the warm drying air. By the time the napalm reaches the discharge end, its water content has been reduced to 0.4-0.8 percent, the government specification.

A screw conveyor carries the napalm from the discharge end of the dryer to the proportioning equipment. Meantime the warm air stream, which contains some napalm dust, is channeled through a three-compartment dust collector equipped with automatic shakers operating on a sequence timing device. Cleaned air is passed to the outside by exhaust fans. The collected solids are returned through rotating locks at the bottom of the dust collectors to the screw conveyor carrying napalm from the dryer.

Napalm, upon reaching the proportioning machine, is elevated to a bin. It is then fed to a blending screw through an accurate electrically-controlled gravimetric feeder.

Where specifications call for it, Santocel is introduced in the proportioning device by means of a second electrically-controlled feeder. The silica aerogel, a Monsanto product, is served by its own bucket elevator and proportioning bin. When used, it is thoroughly blended with napalm by the screw common to both proportioners.

By means of this 35-ft. blending screw, the blended or unblended napalm is carried to a mill room. Here it is automatically elevated to a bin atop a milling machine. The bin, like all others in the plant, is equipped with high and low level measuring devices that warn operators by both lights and bell signals.

The finished product is conveyed from the milling machine via a screw conveyor to the packaging scales.

The mill room is partitioned from the rest of the plant by 12-in. concrete walls. It is equipped with explosion doors in the exterior walls. Due to the hazards in the milling operation, the motors of the mill are operated from the outside by pushbutton stations on a central board.

Interlocking electric relays insure proper sequence on the many motor drives. Failure at any one point over the entire operation automatically stops all the affected operation.

Any trouble on the production line is detected at once and pinpointed through an elaborate plant-wide system of alarm lights and alarm bells. All switch boards (there are eight) have remote control pushbutton stations and pilot lights. Any disturbance is instantly flashed to the operator's attention.

The Ferro plant has several new features: (1) the centrifuge that's used instead of a filter box to dewater the napalm; (2) rotary continuous dryer, which replaced an oven tray dryer; (3) automatic proportioning equipment, which can be set to any ratio of components and has replaced hand mixing and scale-weighing methods; (4) automatically controlled meters, which handle the raw material liquids and have replaced hand-operated valves and stick-measuring tanks; and (5) the new dust collectors, both for the milling machine and the rotary dryer, which have solved a serious problem.

Ferro, which has recently been awarded a 3.5 million pound contract to be delivered this year, hopes to operate its plant as successfully after the national emergency as it does now. Although the plant was built to produce napalm, it is flexible enough to make some types of metallic soaps.

How to Pack Reciprocating Rods Against High Pressures

To design adequately for the severe service conditions found in many high-pressure chemical processes, you must understand and appreciate the fundamental principles of packing.

WALTER COOPEY

Packing a reciprocating rod against high pressures can be most difficult in chemical processes because of the variables which must be considered in addition to pressure. Quite often the reactants, pressures, corrosiveness, solvent action, volume of fluids, temperatures, contaminations, and solids in the fluids are too confidential to discuss with the equipment manufacturer, the packing vendor, and the lubricant salesman. In these cases it is essential that you be able to interpret your requirements in terms of the fundamental principles involved.

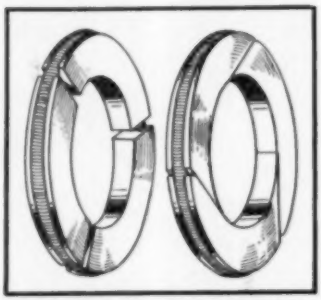
These fundamentals are alignment, quality of materials, finish of materials, lubrication and application.

ALIGNMENT

The importance of proper alignment increases as service conditions become more severe. Misalignment will cause localized hot spots, resulting in distortion and other troubles.

There are two ways in which satisfactory alignment can be obtained: (1) by using rigid construction and precision workmanship; (2) by providing sufficient flexibility in the construction to compensate for any unavoidable misalignment. Except for small-scale equipment it is impractical to use rigid construction. Common practice for commercial installations, therefore, is to use as high a degree of accuracy as conditions will permit and then try to compensate for the unavoidable inaccuracies.

The reciprocating rod or plunger must not weave while passing through the packing. This calls for a rigid support at the stuffing box with provision for flexibility at the connection of the rod to the driving mechanism. The packing itself should never be used as a supporting or aligning medium for the rod, since the function of the packing should be only to hold the fluid pressure with a minimum of frictional resistance.



Metallic packing, segmented radially (left) and tangentially (right). Radial ring faces the high pressure (Fig. 1).

QUALITY OF MATERIAL

Rods—Service conditions, such as pressure, temperature, corrosion and abrasion determine to a great extent the materials that must be used. If corrosion is not a factor, preference should be given to a material which is tough, has good wearing quality, and can be surface-hardened.

There are a number of good steels that can be heat-treated, carburized, nitrided or chromium-plated. Heat-treated steels may be satisfactory with a scleroscope hardness of 50; surface-hardened materials should be 80 or higher. For corrosive conditions you can now get stainless steels that can be hardened, but if these are not entirely satisfactory, you may have to compromise in the design of the stuffing box to get the required protection. This principle also applies when abrasives are present in the fluid.

Packing—The fact that there is need for a better concept of the requirements of a packing installation is evidenced by the large number of different packings that are manufactured. If all factors were given proper consideration, the number of packings listed in most manufacturers' catalogs could probably be greatly reduced. Proper design and maintenance of stuffing boxes is better than attempting to get by with a freak packing combination.

As in the case of rod materials, the packing must be selected to meet the service conditions, and the type of operation will determine to a large extent whether a soft or metallic packing should be used. While there is no distinct line of demarcation, soft or plastic packings are usually selected for liquids and metallic packings for gases.

The soft packing category includes a wide variety of materials, such as cotton, asbestos, hemp, flax, rubber and plastics, which may be combined with some of the soft metals in shredded foil form. The most desirable form is a ring which has been properly shaped and compressed to the stuffing box dimensions. Although the chevron and V shapes are supposed to be self-sealing, they actually are not. The advantage of these packings is that they are made of a tough, fibrous material which has a fair amount of resiliency. After a short period of high-pressure operation all soft packings are formed into a compact mass that has lost any self-sealing characteristic it may have had originally.

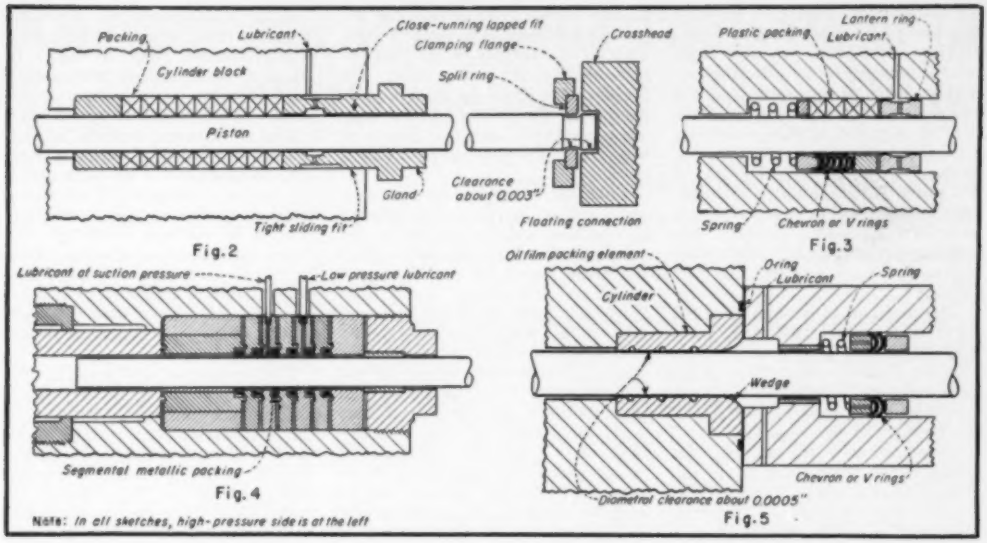
While there are many designs of metallic packing, most of them are the same in principle. They consist of several sets of rings, each ring being made of segments with interlocking and overlapping joints. Springs, usually of the garter type, hold the segments of a ring on the rod and give an initial compression contact (Fig. 1).

FINISH OF MATERIALS

Most engineers used to think that a new packing installation should be broken in before being put into service; many hours were, and still are, so consumed. Metallic packings are even furnished with a serrated finish on the rubbing surfaces, presumably for the purpose of facilitating this procedure. With a soft packing a small

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WALTER COOPEY's article in July on rotating shaft seals hit the spot with many CE readers. Here he draws again upon his 33 years of Du Pont experience. Now retired, he resides in Charleston, W. Va.



amount of running-in may be necessary, primarily to seat and compress the packing in the stuffing box, but the time required for this is greatly reduced by precompression.

Since wearing in means wearing out, your objective should be to start with both packing and rod in the condition which you hope to achieve by the breaking-in step. As the breaking-in step is not controllable, the result may be non-uniform wear of either the rod or the packing or both. By starting out with highly finished and fitted surfaces, you can entirely eliminate any breaking-in and put the equipment into service without delay. You should use the best possible surface finish, therefore, for both rod and packing, taking care that the inside diameter of the packing conforms to the diameter of the rod.

LUBRICATION

No packing, regardless of type, can be expected to operate satisfactorily for any length of time without proper and dependable lubrication. Three types of lubrication are generally recognized — hydrodynamic, boundary and thin-film. With hydrodynamic lubrication the surfaces are definitely separated by a film of fluid whose physical properties are not affected by the thickness of the film. With boundary lubrication there is actual contact of the moving surfaces. This means that the chemical and physical-chemical properties of the lubricant are of utmost importance, and the bulk physical properties, so essential in hydrodynamic lubrication, are of little consequence. Friction in hydrodynamic lubrication depends upon the viscosity of the lubricant, but with a packing where boundary conditions exist and the film thickness is too small to establish hydrodynamic conditions, the importance of viscosity diminishes.

Because thin-film lubrication is intermediate between the other two types, it may be assumed that the bulk physical, the chemical and the physical-chemical properties of the lubricant are all important. Thin-film lubrication is a fairly new concept and further information on the phenomena involved is needed. If conditions permit, it is desirable where thin-film lubrication seems to exist to use a lubricant which combines the desirable properties for both hydrodynamic and boundary lubrication.

There may be definite limitations, because of process considerations, on the kind of lubricant that can be used. This may require that the packing and stuffing box be designed accordingly. Another important factor is the material of construction used for the packing. If the service is corrosive, a corrosion-resistant ductile metal may be required, which would mean boundary lubrication between metals. The actual allowable minimum thickness of an oil film is mainly dependent upon the mechanical finish of the surfaces. If the surfaces are polished, they will in general be capable of operating with thinner oil films.

The main properties of lubricants are viscosity and oiliness, but they must be evaluated for the conditions of service. Viscosity changes with temperature and pressure, but viscosity may mean little if the lubricant is soluble in the process fluid. A relatively poor lubricant in the generally accepted sense may, under some conditions, be much better than one which would otherwise be considered an excellent lubricant.

There is a wide field to select from in the mineral, compounded, vegetable and animal oils, and in the large number of newly developed synthetic lubricants. Even one of the reactants might be acceptable. Any effort to find a fluid that is satisfactory from a chemical standpoint and also has adequate lubricating properties is justified. It will help forestall trouble.

APPLICATION

After you have selected the best design and materials, the next step is to be sure that their application is as good as humanly possible. It is essential that all parts be made to dimensions; that they be absolutely free from dirt and grit; that there be no feather edges to break off and cause trouble; that the lubricating system function and deliver before operation is started; and that any abnormal condition be remedied instead of trying to apply a palliative. While these points may seem obvious, they are frequently overlooked.

Let us see how these fundamental principles are applied to various pack-

ng installations. In Fig. 2 we have the most simple type of soft or plastic packing installation. Proper alignment is provided for by a floating connection between the piston and the crosshead. This arrangement, however, is intended to compensate for a radial out-of-alignment of only a few thousandths of an inch. The end of the piston is flat, although there has been a tendency by some designers to make a ball joint connection. The latter might provide for angular misalignment if there were any, but there shouldn't be.

The lubricant is introduced at the outer or low-pressure end of the packing; this method is recommended for all packing installations. While it has been common practice to introduce lubricant at the high-pressure end of the packing on the basis that it will work out through the packing, this design is not based upon sound reasoning. Here is what's wrong with it:

1. It depends upon a slight leakage, but if a leak starts at high pressure, it quickly becomes worse.

2. Although the packing at the outer end of the stuffing box is the most highly compressed and receives the most wear, it gets the poorest lubrication.

3. An oil hole through the cylinder wall in the high-pressure zone is a point of high stress concentration which will cause fatigue failure.

4. Adding the lubricant to the process fluid causes a deterioration in lubricating properties.

5. If the lubricant is a contaminant, it is put where it hurts the most.

6. The lubricating system must be designed for the maximum pressure.

With the recommended system, you need a pressure only slightly higher than the pump suction pressure. The lubricant is forced through the length of the packing, and even at the highest pressures for which this packing can be used it will be found that some lubricant has entered the cylinder. The packing which receives the most severe service is sure to be well lubricated.

The packing arrangement in Fig. 3 is similar to that in Fig. 2, with two exceptions. The lower half of the sketch shows a stack of chevron or V packing rings and, at the high-pressure end of the stuffing box, with either type of packing, is a large helical spring. The spring is the more important. With soft or plastic packing a void occurs at the bottom of the packing after a period of service, owing to compression and wear. This void permits the lower rings to float around somewhat loosely. If adjustment of the gland is delayed too long, leakage occurs. The purpose of the spring, therefore, is to keep a light load on the bottom of the packing, particularly on the suction stroke. On the discharge stroke the fluid pressure compresses the packing so that leakage is prevented until it is caused by wear. The action tends to be automatic.

Lubricant is supplied at a pressure above suction so it is forced between the packing and the piston on the suction stroke. It is a case of boundary lubrication, with the film being renewed on each stroke.

Metallic packings of the segmental type are best adapted for gas compression. Fig. 4 shows an application which is conventional except for the way in which the lubricant is supplied—between each two sets of rings—and the number of rings. The catalog of a reputable manufacturer shows packing arrangements of 10 rings for 1,500 psi. pressure and 14 rings for 6,000 psi. Excessive packing of any kind can do more harm than good unless each ring receives an adequate supply of lubricant. Six rings should be sufficient for any pressure up to 20,000 psi.

Although it is considered that the rings "float," they will not do this at high pressures. If the suction pressure is low, there can be some movement on the suction stroke, but in the higher stages of a multi-stage compressor or in a high-pressure recycling compressor there will be no floating. Because of this, the preparation of the packing and the application of the lubricant need special attention.

Under some conditions an approach to thin-film lubrication may exist, but as a rule it is of the boundary type. This requires careful selection of the metal for the packing rings so that they will have some anti-friction properties. Generally the bronzes are a first choice although, when conditions are right, cast iron will do a good job. If the least abrasion occurs, however, cast iron makes a good grinding compound.

The use of serrated surfaces on the inside of the rings is ill advised because it necessitates a large number of rings and a long breaking-in period. Rather, the surfaces should be finished smooth and then be lapped to the piston. There should be no sharp edges which will prevent the lubricant from getting between the packing and the piston.

For good alignment there will be a floating connection between the piston and the crosshead, with a bushing on each side of the packing for piston support.

In the packing examples previously described, the lubrication has been of the boundary type. In Fig. 5 is shown a packing whose performance depends upon hydrodynamic lubrication. It has long been known that a film of lubricant between moving surfaces is capable of retaining very high pressures, but it has been necessary to use a means of developing a lubricant pressure as high as the pressure to be retained. Although the theory and application of wedge action have been used for developing lubricant pressure in certain types of bearings, the idea shown here is a new concept of the principle (U. S. Patent 2,369,883).

The packing element consists simply of a close-fitting bushing which has a rounded or tapered entrance at the outer or low-pressure end, where the lubricant is introduced at approximately suction pressure. Extremely high pressure can be produced by wedge effect. For the establishment of a pressure film, the film thickness must be variable, with the inlet thickness greater than the outlet thickness.

With perfect film lubrication, involving complete separation of the moving surfaces, the only friction that takes place is in the lubricant, and wear will therefore occur only in it. Theoretically, with film lubrication the materials of construction should be of relatively little importance, as far as wear is concerned, whereas with boundary lubrication the wearing qualities of materials must be considered.

With the lubricant being delivered at a constant low pressure, on the discharge stroke the wedge action builds up a film pressure between the plunger and the packing element which balances or exceeds the cylinder pressure. It has been demonstrated that lubricant at atmospheric pressure can be forced through a packing element against a pressure of 10,000 psi. On the suction stroke, the lubricant and the cylinder fluid are under balanced pressure conditions.

This packing is satisfactory for either liquids or gases. Improvements under consideration will increase the flexibility and extend the pressure range to anything that is commercially desired.

There is no one packing design that can be universally applied to reciprocating rods. However, by carefully analyzing all the variables and by finding the right combination of packing, lubricant and materials, you can develop an installation that will give satisfactory performance for almost any conceivable pressure and service.

New & Better Processing Tools Point to Improved Efficiencies and Lower Costs

Again at Exposition time the editors review the trends and developments in equipment and techniques which are of the greatest significance to the process industries.

Although current emphasis in the chemical process industries is on expansion of facilities to meet the demands of defense, continuing improvements in equipment and technology are helping the industry get more production and higher quality with less expenditure of labor, materials and capital. Many of these improvements can be credited to chemical engineers in the industry; others to the chemists, metallurgists, physicists and design engineers of the engineering and equipment companies who have made their developments available to the chemical industry. In most cases the greatest progress results when the manufacturer and user work closely together in the development.

In looking over the two years since our previous review (*Chem. Eng.*, Nov. 1949, pp. 103-109), we find the beginning of some trends, the accenting of some previous trends, and a number of individual items whose significance has yet to be measured.

Materials Handling

More diversification for fork trucks, devices to reduce aisle widths, characterize advances.

The pallet system of handling, and with it the fork truck in all its many variations, has continued the rapid development that started during the early war years. There is still no completely satisfactory answer to the problem of the expendable pallet. Consequently, some of the effort has been directed toward means for eliminating pallets entirely. Mostly, however, the fork truck has developed new variations for special purposes.

Several of the ideas have been aimed at improved maneuverability, with narrower aisles. One approach is to hinge the forks, so that they can be swung with their load at an angle to the center line and thus require less of a turn of the truck. Du Pont introduced an idea called the stacker crane which dispenses with the truck entirely, substituting for it an overhead bridge crane from which depends a leg carrying a lifting mechanism and a pair of forks. The aisle width need be only about 18 in. greater than the length of the load. The arrangement requires a little more head room above the storage area than a fork truck needs but saves on floor space.

Another method of reducing aisle width requires a special pallet with sides which carry hooks. This enables a truck equipped with corresponding hooks, rather than forks, to pick up and carry the pallet in a horizontal position. A narrower aisle can be used because no space is needed to insert or withdraw the forks.

To make sure that its fleet of fork trucks is being used most efficiently, Johnson & Johnson has adopted a taxi-fleet idea at its Metuchen shipping center. Each of the seven lift trucks is constantly in contact with a central dispatcher by means of two-way radio. The effect is to get trucks where they are needed with maximum speed, while insuring maximum utilization of the trucks at all times.

Fluids Handling

Pumps are more versatile; magnetic drive eliminates seals; new plug valves don't stick.

The trend to higher rotating speeds for centrifugal pumps and compressors has continued. In boiler feed pumps, for example, speeds of 8,000 to 10,000 rpm. are becoming commonplace, and some centrifugal compressors are operating at even higher speeds. These installations are usually turbine driven, although electric drives with step-up gearing can be used.

An opposite trend, toward slow speeds, is evident in the development of pumps for handling highly viscous fluids and sludges. For such materials, large pumps operating at low speeds have proved more practical than smaller pumps at higher speeds. This is particularly true where suction lifts are required.

Pumps have been designed for handling materials formerly considered unpumpable. Wood rosin is a good example. It is solid when cold; when hot it is very thin and impregnates almost any packing. When the pump is shut down the packing freezes to the shaft. The answer to these difficulties is a jacketed pump with jacketed stuffing boxes to heat the pump before starting, then cooling the stuffing boxes when in operation.

Another pump recently announced is designed for handling thick sludges and pastes. A cutting cylinder bites out a core of stuff at the bottom of a feed hopper; a piston then shoves the core into the discharge pipe. On the return stroke of both piston and cutting cylinder, a partial vacuum assists gravity in filling up the space vacated by the previous slug.

Elimination of stuffing box leakage is the aim of many recent pump designs. The most revolutionary of these is a pump which has no stuffing box or seals whatsoever. It is magnetically driven after the fashion of the axial air gap motor, with no mechanical connection between the driving magnet and the pump rotor. If this design should prove to be practical and economical, many of the chemical engineer's pumping headaches will be relieved.

Many other of the chemical engineer's recurring headaches are caused by valves which leak or stick. Two new plug valves are designed to overcome such difficulties. In one, the plug is first lifted from its seat without rotation, then turned, then reseated without rotation, all in one continuous movement of the operating lever. Since the plug is free when turned, lubrication is not required. Another plug valve of the conventional type is being made of a new stainless alloy which can be successfully hardened to overcome galling but which offers corrosion resistance similar to that of Type 316 stainless. Up to now, hardenable stainless alloys have left much to be desired as regards corrosion resistance.

EQUIPMENT REVIEW . . .

Heat Transfer

Extended surface gets the headlines; water shortages mean more air-cooled exchangers.

Developments in heat exchangers have been largely concerned with extended surface. This situation is the logical outgrowth of much work in the tonnage oxygen field. Here the use of extended surface is essential to getting highest capacity in the smallest possible volume when transfering heat from one gas to another.

Because of the good low-temperature properties of aluminum, this material has been used in the oxygen plants. Details have recently been published on an extended surface exchanger made of brazed aluminum. Basic design of these exchangers is relatively simple; the units are built up of alternate layers of corrugated fins and flat sheets of aluminum. The critical step in production is the brazing of the assembly at temperatures very close to the melting point of aluminum. This is done by preheating the assembly, then plunging it into a molten salt bath at a temperature closely controlled just under the melting point, but hot enough to melt a thin coating of brazing alloy on the surface of the aluminum sheets.

Some of these units have as much as 450 sq. ft. of heat-transfer surface per cu. ft. of space. Unlike conventional heat exchangers, units may be built to handle as many as five different streams at once. Flow may be parallel, countercurrent, or crosswise; streams may be taken off at any point along the length.

Another type of exchanger consists of a stack of perforated plates separated by appropriately designed gaskets. In flowing through one of the passages, consisting of alternating holes and open spaces between plates, the gas stream is subjected to the turbulent effect of alternate contractions and expansions, even though the over-all flow rate might normally be considered in the laminar range. This gives a high rate of heat transfer with a reasonable pressure drop.

Water shortages in many areas have emphasized the need for recirculation of cooling water. Although atmospheric cooling towers are commonly employed, the use of extended-surface water coolers has increased tremendously. These coolers operate on the principle of an automobile radiator, with air blown across the surface by a large fan. These units are limited, of course, by the dry bulb temperature of the atmosphere; their chief advantage is complete recirculation of water with practically zero makeup. They are economical where power is relatively cheap and water expensive.

This type of unit is also being used for cooling of process fluids, refrigerants, lubricants, etc., in order to eliminate the need for cooling water entirely. Such applications ordinarily require an approach temperature of at least 10 deg. F. to be feasible.

An unusual heat exchanger design has recently been developed in England and is being introduced currently in this country. It consists essentially of a graphite cube drilled with a large number of parallel holes arranged in rows, each row of holes running at right angles to those above or below. The fluid streams are led into and out of the block by means of headers bolted to opposite faces of the cube. The exchanger occupies about ½ the floor space and ½ the volume of equivalent tube bundle types.

For closely controlled high-temperature processing applications, Dowtherm vapor systems are finding growing competition from high-temperature liquid systems. The increasing feasibility of liquid heat-transfer systems has followed the development of suitable carriers. One of the best of these, suitable up to 600 deg. F., is a chlorinated diphenyl. For somewhat higher temperatures, organic silicates are now available for services up to 800 deg. F.

Although vertical cylindrical furnaces are finding increasing favor for direct-fired process heating applications, a new radiant heater offers interesting possiblities in improved economy and operating control. The heater uses radiant ceramic cup gas burners, mounted in any desired pattern on two facing walls. Between the walls are the pipe coils carrying the fluid to be heated. Each burner can be individually controlled, allowing great flexibility on controlling the time-temperature heating curve of the process.

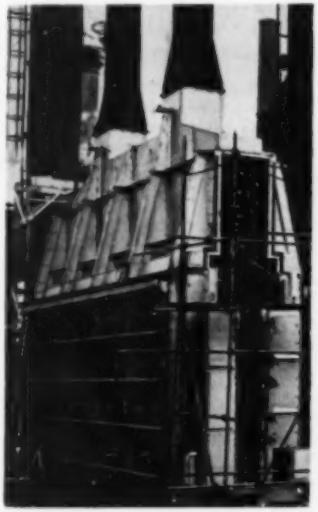
Size Reduction & Enlargement

Vibrating ball mill grinds exceeding fine; agglomeration is now in the limelight.

There is a continuing interest in size reduction to particles in the micron range. Fluid energy mills, which are eminently suited for fine grinding, have heretofore been available only on a rental basis, requiring the producer to report confidential production data for calculation of royalty charges. A recent change in policy of one maker of these mills provides for outright purchase. The new policy should stimulate further interest in fluid energy grinding.

Another new development in fine grinding is the vibratory ball mill. The National Bureau of Standards has constructed a small laboratory mill which may prove the basis for improvement in plant-size mills. A somewhat similar idea is reported to have been used abroad commercially.

The bureau's machine consists of a cylindrical jar containing steel balls,



RADIANT HEATER has individually controlled burners for flexibility.



FLUID ENERGY MILL uses a steam or air jet for fine grinding.

supported on a housing containing an eccentric rotating weight. Weight of the housing is carried on springs so that when the motor rotates the eccentric weight at 1,800 rpm. the housing is swung through a circular path that is confined within limits by the springs. In addition, the jar and its cylindrical holder rotate slowly on a greased slip ring which confines the holder flange against the eccentric housing. This rotation, caused by centrifugal force, takes place at about 4 rpm. in the direction opposite to that of the rotating weight and serves to redistribute continually the material being ground. The mill has been applied in reducing cotton fibers to 10 microns or less in 30 min.

An interesting new wrinkle in grinding technology is the use of liquid nitrogen to chill the material to be ground, thus improving its grindability. Materials which may be handled this way are those with low melting points, those which are too tough to grind by conventional methods, and heat-sensitive materials.

Agglomeration, or size enlargement, is receiving a lot of attention these days, especially in connection with the processing of ores, fertilizers, and carbon black. The large-volume, low-cost applications, wherever possible, use rotating drums individually designed for the job. One equipment manufacturer, however, has standardized on a drum for fertilizer granulation.

For applications requiring firm particles of well defined shape, such as catalyst pellets, extrusion equipment is being used. Several manufacturers have recently come out with machines especially designed for production of catalyst pellets. They involve extrusion of a stiff paste through a perforated die, with the extruded material being cut off into pellets of the desired length by whirling or reciprocating knives.

Fluidizing

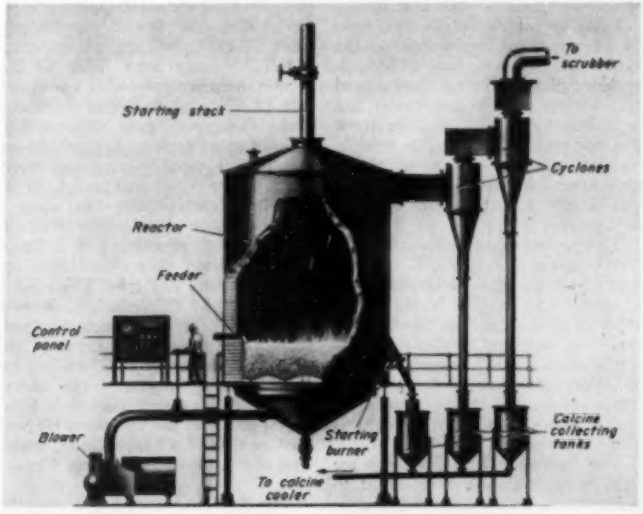
Fluidizing goes into new types of operations such as new reactions and pyrites roasting.

Applications of fluidized solids techniques continue to make news. Fluid catalytic cracking has spread widely, and now the petroleum industry has adapted fluid catalyst methods to still another process, hydroforming. Developed by Standard Oil Development, Standard of Indiana, and M. W. Kellogg, the process is being installed in several plants for reforming low-octane naphthas to avgas and aromatics.

Meanwhile, the Dorr Co., SOD's licensee for non-catalytic uses of fluidizing, has continued development of the process for lime calcining, roasting of ores and similar applications. One new idea is a fluidized dryer-sizer. Material to be dried and classified enters a "boiling bed" where drying takes place. Fines carry over to cyclones, while coarser material discharges by gravity from the fluid bed.

Dorr is meeting the sulphur shortage by offering a fluidized pyrites roaster suitable for handling a variety of sulphur-bearing ores and producing an extremely high strength gas—up to 15 percent SO_2 on 48 percent pyrite. It has been reported that nearly 40 such roasters are on order. The new method is said to compete favorably cost-wise with the conventional rabbled roaster, and in addition is claimed to have advantages in control and high gas strength.

One novel application of fluidization outside the usual sorts of applications occurred in the field of fire extinguishment. A piped dry chemical extinguishing system distributes the chemical to a group of heads in the protected area by fluidizing with nitrogen gas at a central point, then piping the fluidized mixture to the points of use. For the first time this system enables dry chemical fire protection to be supplied in a manner comparable to a sprinkler system.



PYRITES ROASTER burns a fluidized bed of sulphur-bearing ore to get a gas higher in SO_2 content than can be produced by conventional rabbled roasters.

Low-Temperature Concentration

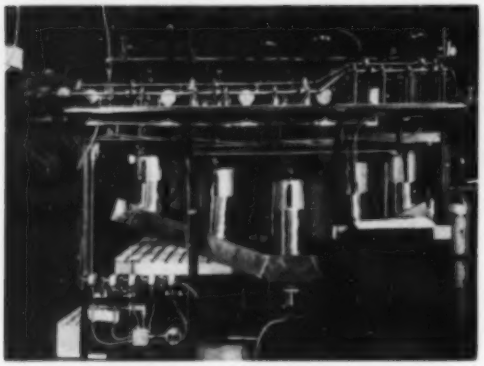
More processing of heat sensitive materials means more work for low temperature methods.

The low-temperature concentration methods for heat-sensitive materials have progressed in several different directions in recent years. Much of this development has taken place in the food industry, but it is also of interest in the production of other materials such as antibiotics, biologicals and blood plasma. In the main, the processes are of three types: low-temperature evaporation, vacuum sublimation, and removal of part of the water of solution by freezing.

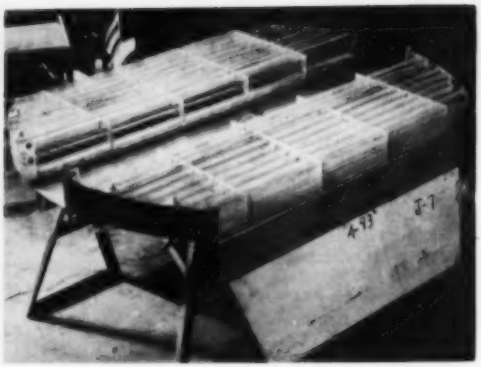
Several processes of the first type have gone extensively into use in citrus concentration. In one variation process heating and cooling are both provided by a refrigeration cycle. The refrigerant vapor, either water or a conventional refrigerant, is compressed and the heat of compression removed in heating the feed to the evaporator. The refrigerant is then expanded to cool a condenser which is used to maintain a low pressure in the product evaporator. The product, in turn, evaporates under this low pressure at a low temperature such as 60 deg. F.

Thermodynamically, such a process is equivalent to a vapor recompression evaporator. It is interesting to know, therefore, that the old vapor recompression cycle has also been applied recently for low-temperature evaporation. And side by side with these trickier cycles, ordinary high-vacuum, multiple-effect evaporators are also operating on the same problems.

Vacuum sublimation from the fro-



FREEZE CONCENTRATOR uses five countercurrent stages to avoid excessive entrainment of solute in the ice crystals.



FRACTIONATOR TRAY is designed for high capacity and low pressure drop. It permits use of smaller towers.

zen state has been used extensively in the drying of especially heat-sensitive materials, including blood plasma and some of the antibiotics. A new variation of this process now under development employs continuous freezing on a metal belt, followed by sublimation of water vapor from the ice carried by the belt. Sublimation, both of the vacuum and of the entrainer types, is being used increasingly for the separation or purification of normally solid materials, at relatively low temperatures. For many purposes the entrainer method is being found suitable, with its advantage of operation at atmospheric pressure. The entrainer permits vaporization at lower than normal temperatures by making use of the partial pressure effect of the entrainer, as in steam distillation.

Both in the United States and abroad interest is being shown in processes which concentrate water solutions by freezing out a part of the water. Descendants of the old Jersey applejack process, these modern variations stage the freezing process so as to avoid the entrainment of excessive amounts of solute in the ice which is removed. For example, the Commonwealth Stepfreeze process, which is the latest version of the countercurrent freeze concentration process decribed in *Chemical Engineering* two years ago, uses five stages. In each of these small ice crystals are formed under proper conditions of agitation, then removed by centrifuging. The ice so removed is water-washed and the concentrated solution sent to the next freezing vessel, where it is cooled to a still lower temperature. On citrus the yield is said to be 95 percent of the juice in the fruit, at a concentration of 61 deg. Brix.

Distillation & Extraction

New trays and packings are more efficient; new extractors save headroom, eliminate fines.

The Kaskade tray is making strong inroads in the field once virtually monopolized by bubble-cap columns. This trend has been accelerated by the recent development of a horizontal design which operates with a very low pressure drop. Another advantage of the new tray is a high degree of operating flexibility.

Vapors flow in passages formed by curved boundaries which approach each other in a manner resembling a venturi. This design, called the Benturi, is said to be responsible for the low pressure drop and high vapor handling capacity of the new tray.

Liquid-liquid extraction may also be an important application of the horizontal Kaskade tray. There is evidence that both the height and cross-section of a packed tower can be halved by the use of these trays. The low pressure drop makes possible the commercial operation of extraction towers where the difference in specific gravity of the liquids is as low as 6 percent.

Things have not been static in the bubble-cap field itself. A new type of cap has been developed which is reported to give far better liquid-vapor contact than the conventional cap. The new cap is similar to the conventional slotted cap except that the slots are replaced by a nearly horizontal screen skirt. Besides increased efficiencies, pressure drop is also said to be less.

New types of tower packing are still being developed in an effort to reduce costs and improve efficiencies. Cost reduction is achieved through utilization of inexpensive forms of metal offering a lot of surface area, such as expanded metal lath and wire screen.

A new packing, known as Panapak, is fabricated from metal lath in a fairly simple manner. In one arrangement, seven layers of ⅜-in. diamond metal lath is formed into a series of ridges and valleys by pressing over a wooden form in a standard press. This operation produces a serrated mat or layer of packing. A series of mats formed in this fashion is assembled within the tower for larger installations, while in smaller ones the packing is made up in the form of a cartridge for insertion through the top of the tower.

This packing is said to have a capacity ranging from 150 to 200 percent of the allowable vapor velocity for bubble-cap towers, depending upon the liquid downflow rate. H.E.T.P.'s range from about 30 in. at minimum recommended operating rate to 12 in. at optimum operating rate. Compared with conventional types of tower packing, Panapak shows a 4.5 to 1 capacity advantage over ½-in. raschig rings and a 2.5 to 1 capacity advantage over 1-in. rings.

Dixon gauze rings are made of 60 and 100-mesh wire gauze in a Lessing ring shape in nominal sizes of 1/16 in., ¼ in., and ½ in. Efficiencies as high as 84 theoretical plates per foot of height have been attained with some columns, according to claims. Performance is dependent to a large extent, however, upon vapor velocity and column diameter. Efficiency of a 2-in. dia. column is 80 percent of that of a 1-in. column, while that of a 4 -in. column is only 50 percent.

The Rotocel extractor is a recently developed device for extracting oil from vegetable seeds. Its low height

—less than 13 ft.—is an outstanding advantage. It requires much less headroom, therefore, than the conventional basket extractor.

It consists of a 5-ft. high rotor divided into 18 sector-shaped cells turning slowly inside a vapor-tight tank. Oil-bearing flakes are fed continuously as a slurry. As they move around the circular path the flakes are flooded in successive extraction stages by an oil-solvent mixture, with gradually increasing solvent composition, in a countercurrent arrangement. Minor changes can make the unit operate either truly countercurrent or stagewise countercurrent.

Another new extractor is designed to eliminate the problem of fines. It consists of a vapor-tight housing enclosing a continuous horizontal porous belt upon which the oil-bearing material is spread. Solvent, sprayed onto the surface, percolates through the bed of solids.

The Exsolex oil extraction process combines mechanical expelling with solvent extraction. In this way oilseed having a comparatively high oil content can be processed with maximum yield and low cost.

A device developed in Germany for liquid-liquid extraction has recently been introduced in this country. Known as the Luwesta extractor, it is designed for the same sort of jobs as the better known Podbielniak machine. Like the latter, it employs centrifugal action, but unlike the continuous countercurrent Podbielniak, the Luwesta employs a multistage countercurrent action, using three stages. The stages are disposed vertically; the machine thus bears some resemblance to a centrifugal cream separator.

Adsorption & Ion Exchange

Hypersorption expands, Arosorb comes in; mixed beds offer better deionization.

Equipment and techniques for continuous adsorption of gases by the Hypersorption process have recently been improved, stimulating further interest in this process for such jobs as recovery of ethylene or acetylene from streams of mixed gases. Hypersorption uses a moving bed of activated carbon to adsorb and fractionate the components of a gas mixture. Commercial Hypersorbers now have capacities up to 16 million cubic feet per day and can produce as many as four well fractionated products with a single tower.

Major improvements have been made in the gas lift system. Attrition losses of carbon have been greatly reduced. A recent variation in design provides two feed trays in the tower to double the feed gas throughput capacity.

The new Arosorb process employs adsorption from the liquid phase in order to concentrate the aromatic fraction from a catalytic reforming operation. The feed stream, containing aromatics, passes through a bed of silica gel, where the aromatics are adsorbed. When the bed nears saturation, feed is shut off and the bed desorbed. Butane, the first desorbent, washes out saturates left from the feed stream. Then a stream of mixed xylenes, used as the other desorbent, gradually desorbs the aromatics adsorbed on the gel. When desorption is substantially complete, the cycle is repeated.

Although various concerns and institutions interested in ion exchange are understood to be working toward the development of a continuous ion exchange system, no successful continuous method has yet been announced. Main developments in ion exchange recently have been in new types of uses and in the mixed bed system of deionization. In this latter system the functions of anion and cation exchangers are combined in a single vessel, using a mixture of the exchange resins. For regeneration the resins are separated hydraulically on the basis of difference in specific gravity. After regeneration the resins are again mixed by a flow of controlled turbulence.

This method offers some saving in equipment cost, but its main advantage is in improved performance under suitable conditions. In the deionizing of water, for example, a water of much lower dissolved solids content can be produced than is possible by the conventional two-bed method. The effect is that of a multiple-bed unit of an infinite number of stages. Advantages are also realized in other deionization uses because the pH remains contant at 7.0. For example, in the purification of sugar solutions, inversion is avoided—at no time is the solution acidic, as would be the case in the two-bed system.

Ion exchange is making slow but evidently sure progress in a variety of applications other than water purification. One suggested use is in the recycling of waste waters in scarce-water areas. It is being used to clean up metal-ion-containing wastes before discharge to water courses. It is being used in the purification of formaldehyde and of glycerine.



HYPERSORBER stands 207 ft. high, is 9½ ft. in diameter.

Mechanical Separations

Liquid cyclones introduced; new filter permits good washing; filter fabrics are improved.

Although progress has been more rapid in the field of dust collection (see section on Pollution Control), several interesting new developments have been made in liquid-solids separation equipment. Among these are two new devices utilizing centrifugal force.

The DorrClone resembles an ordinary dust-collection cyclone but differs in that it operates on a liquid containing suspended solids, rather than on a gaseous suspension. The principle of operation, however, is very similar. The liquid suspension enters the unit tangentially under pressure near the top and spirals downward in the conical section toward the apex valve. Coarser particles continue downward and leave as underflow; finer fractions turn and spiral upward through the center of both conical and cylindrical sections, leaving as an overflow product. Capacity and cut size are primarily functions of diameter and pressure drop, although other design

details and adjustments are also important.

The Centriclone is designed for the same type of job. It differs from the DorrClone in that the centrifugal force is provided by an internal rotating impeller rather than by the kinetic energy of the entering fluid. It differs, too, from ordinary centrifuges, which develop centrifugal force by whirling of the basket. The important advantage of the Centriclone is that residence time within the unit can be varied at will, independent of impeller velocities.

A new liquid filter, not yet in commercial production, permits thorough washing of both the filtering medium and its supporting grids. This feature makes it especially suited for filtration of saturated solutions, such as sodium sulphate, which tend to freeze or crystallize in the filter.

The machine consists essentially of a series of trays so arranged that they form the links of an endless chain. Each tray is provided with a grid to support the filter cloth. The trays and cloth are driven separately, but at a synchronized speed. Attached to the under side of the trays is an endless rubber belt which serves as a moving valve seat. Its purpose is to expose each tray in a desired sequence to various pressure or flow conditions. Provisions can thus be made for vacuum filtration, washing, hot air blowing, etc.

Of great interest in the filtration department is the development of special synthetic filter fabrics with desirable flow properties. These properties are obtained by imparting to the yarn strands twists of 10 to 40 turns per inch of length, as compared with twists of $\frac{1}{4}$ to $\frac{3}{4}$ turns per inch given ordinary yarn.

With conventional filter cloths, the larger portion of liquid flow is through the yarn itself, with only a minor fraction through the apertures between the strands. This is because the strands flatten out when woven into cloth, and leave very little open space between them. The new high-twist yarns, however, resist this flattening effect, leaving definite apertures between the strands. The flow distribution is reversed, with most of the flow through the apertures and very little through the yarn itself.

This feature greatly reduces loading of the yarn with solids, precipitation of solids in and on the surface of the yarn, and problems presented by action of fungi, algae, and bacteria. Flow rate is greater, cleaning of the cloth is easier, and life of cloth is longer.

A novel idea applicable to the screening of damp solids is heating of the screen to avoid blinding. This is done by impressing a low-voltage alternating current across the screen via special bus bars which extend the full length of the screen on each side. The screen wire offers resistance to flow of current, just enough to produce the desired heating effect. Voltages and temperatures are purposely kept low for safety reasons.

The damp material picks up enough heat from the warm screen wire to drive off some of its moisture content, resulting in freer flow through the screen. Capacity increase of as much as 50 percent is reported. Another advantage is the elimination of the heating which would ordinarily be required to keep the screen open.

A number of devices have been brought out for removing entrainment from gases and vapors. Although purification of steam or compressed air in pipelines represents the major application, some of these units are designed for installation inside process equipment, such as evaporators and fractionating towers. Acceptable efficiency and low pressure drop are prime considerations. From the standpoint of application to existing equipment, such devices are made so that they can be knocked down and passed through manholes for assembly inside the equipment.

Pollution Control

Industry is active in pollution control, not only from necessity, but for public relations.

Pollution control is taking on increased urgency in spite of the problems in equipment procurement caused by the shortage of steel. Public authorities have increased their efforts following passage of the Federal Water Pollution Control Act in 1948 and in view of the likelihood of similar air-pollution control legislation for the future. However, the movement toward control of its effluents by industry goes farther than action aimed merely at complying with legal requirements. Especially on the part of the chemical industry, as the activities of MCA have shown, management is beginning to recognize the important public relations dividends that will come from pollution control efforts.

Success in the cleaning up of air contamination and water-borne pollution is coming from many directions, much of it from adaptation of older equipment to new needs. This is especially true of the control of water pollution, which largely makes use of equipment that has long been used in sanitary engineering. Included are numerous types of screens, filters and settling devices, as well as the biofilter and other methods of biological treatment.

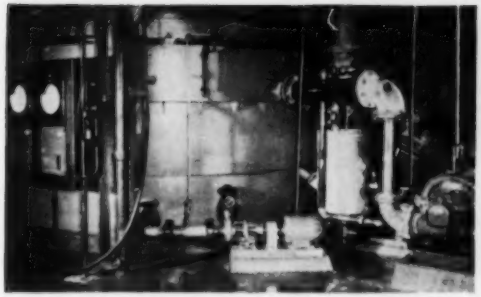
Newer devices have been developed for the recovery of light solids, especially those which tend to remain suspended, neither floating nor sinking. One type pulls a vacuum on the suspension to remove dissolved air in the form of fine bubbles which rise, buoying up the suspended material. Another type mechanically disperses large numbers of extremely fine air bubbles in the liquid. These rise and carry the suspensoids to the surface. This unit is claimed to handle flows as high as 6 gpm. per sq. ft. of surface and to be able to handle both suspended particles and immiscible liquids.

Recently reported is another method of coagulating fine suspended particles through the use of ultrasonic vibrations. This method is being used for the agglomeration of fine wood fibers in a paper mill discharge. The ultrasonic generator is of the piezoelectric type, but it is novel in using synthetic piezoelectric elements of an oriented barium titanate ceramic which can be assembled in mosaic form as "transducers" of any desired size and shape. The currently favored form is parabolic, so as to focus relatively large amounts of vibrational energy in a small working zone.

Sound energy, but in the sonic rather than the ultrasonic range of frequencies, has also been applied recently in the agglomeration of aerosols. In this case the sound producers are sirens capable of concentrating large amounts of energy in the fairly small space of a treating chamber. Applications have been made on sulphuric acid mist, shale oil mist, and a number of dusts.

Among process industries, the paper industry is one of the most active in its search for means of cleaning up pollution. An especially bad problem has been that of the sulphite pulpers, whose residual liquor from the digesters cannot be recovered profitably. Efforts have long been made to evaporate the liquor so that it could be burned, but ordinary evaporators have been unusable owing to severe scaling by gypsum.

Now the problem seems to have been licked by a group of Wisconsin sulphite mills. They are building evaporating plants using a flat-plate evaporator based on the Swedish Rosenblad system. Instead of tubes the evaporator uses flat-plate heating surfaces. This makes it possible to switch the steam and liquor sides of



FLOTATION UNIT recovers light solids from liquid process wastes. Innumerable tiny air bubbles do the job.



DUCTILE IRON bridges the gap between cast iron and cast steel. This pump case and cover weigh over 4 tons.

the heating surfaces every few hours, so that the fouled surfaces later become the steam side and are cleaned by the steam and condensate. The process evaporates the liquor from 10 to 65 percent solids, enabling it to be burned under boilers.

Much recent effort has been directed toward the control of air pollution, and a number of new processes and types of equipment have resulted. Several new developments in fine dust filters are typical of these accomplishments. One of these employs a special paper of asbestos and cellulose fibers and despite relatively low resistance is able to stop virtually all solid particles down to 0.2 micron. Several filters now on the market make use of electrostatic forces to stop the particles. These are generally made effective by the impregnation of the filter with a plastic. In one type the electrostatic charges are said to come from mechanical fracturing of the plastic, in others by charging of the plastic by airflow friction. Mechanical aspects of filtration devices have also been improving, especially in the development of blow-back filters which are continuously self-cleaning and can therefore make use of denser filter fabrics to stop finer particles.

There has been considerable activity in the development of processes for the controlled oxidation of organic wastes. One of these is catalytic combustion of gaseous wastes. Hydrocarbon vapors in air can be oxidized at temperatures around 500 deg. F. by passage through a catalyst screen resembling a woven wire filter mat. Du Pont recently announced a vapor-phase process for destructive oxidation of organics which makes use of a copper chromite catalyst. Du Pont has used the process on waste vapors containing such organics as methanol, formaldehyde, and ethylene glycol. Further development is expected to extend the process to liquid wastes as well. A still unannounced process for liquid wastes containing small percentages of organic materials holds out hope for the economical recovery of the heating value of the wastes.

One new waste disposal method that has recently been attracting attention is to pump the waste down a well. The method has been used for some time in the southwest for disposing of oil well brines but has now seen its first chemical plant use. The method is costly if a well must be drilled for the purpose, and there must be certainty that the geological structure is proper and that ground water contamination will not result.

Materials of Construction

Alkali-resistant glass, ceramics and plastics compete for spotlight with metals and alloys.

Titanium, bouncing baby of the materials of construction family, is being consumed, for the most part, in direct military applications. Its main attraction for the chemical industry is its resistance to corrosion by many chemicals; its present military uses, however, are based largely upon its physical and mechanical properties. Commercial production of titanium tubing has been announced, and, no doubt, other forms which could be incorporated into process equipment are being made, but scarcity of the finished metal and its high price at present are delaying full exploitation of titanium as a material of contruction for the process industries. In certain isolated cases where titanium has been used in process equipment, it has replaced other expensive alloys or mechanically unsuitable nonmetals.

Extra low carbon stainless steels (0.03 percent maximum) are now in commercial production. Until recently, austenitic stainless steels having very low carbon contents could not be produced commercially—the lowest carbon of commercial level of acceptance was 0.08 percent maximum. Fabrication of process equipment by welding of these compositions caused carbide precipitation at the welds and resulted in susceptibility of these areas to intergranular corrosive attack.

The conventional means for preventing intergranular attack has been annealing of the welds, but where this is not practical, a stabilizing agent, either columbium or titanium, is added. The new ELC alloys can be welded without requiring either annealing or stabilizing. They can be used in many applications with no loss in corrosion resistance. The present scarcity of the stabilizing agents makes the commercial availability of ELC alloys doubly significant.

One of the less spectacular but, nonetheless, one of the most significant recent developments in the materials of construction field is ductile cast iron. In the last two years this material has attained wide acceptance because of its excellent castability, high mechanical properties, and good machinability. It has greatly narrowed the gap between cast iron and cast steel.

The remarkable properties of ductile iron are brought about by the introduction of magnesium or a magnesium-containing agent, such as a nickel-magnesium alloy. It takes only a small amount of Mg—about 0.1 percent is usually sufficient. The special process involved overcomes the former belief of metallurgists that magnesium was completely unalloyable with iron.

The magnesium converts the normal flake form of graphite in cast iron to a spheroidal form. This gives rise to the names given the new material, such as nodular or spheroidal

iron, or trade names like Noduloy.

Even with its objectionable mechanical properties, cast iron has found rather wide use in the process industries. Its corrosion resistance is satisfactory for many applications, and it certainly is one of the least expensive materials of construction. Now that ductile iron is available, chemical engineers can specify cast iron for jobs where, in spite of suitable corrosion resistance, it formerly would have been unsuitable from a mechanical standpoint.

For one particular service ductile cast iron offers an improved chemical resistance. Ordinary gray cast iron, although suitable for use with concentrated sulphuric acid, cannot be used with oleum. The acid apparently penetrates the metal along the graphite flakes, and the metal may split open in service. With the elimination of flake graphite, ductile cast iron should be satisfactory for oleum service.

In the field of non-metallics, a new glass composition with improved alkali resistance might prove to be the most important development in recent years. Available in the form of coatings on steel, the new glass shows at least three times the resistance of standard compositions in the pH range of 10 to 12 and at temperatures up to 212 deg. F. This improved resistance is achieved without any important sacrifice in acid resistance.

This new glass should be especially useful in processes which involve conditions varying from acid to alkaline throughout the operating cycle. One application being made is the handling of hot alkaline hypochlorite solutions, where standard glass-lined equipment has been used, but with rather short life compared with that obtained in acid service.

The utility of glass-lined piping has been expanded by the recent development of improved methods of making joints. Threaded joints can be assembled in the field with alloy couplings by providing each end of the pipe with short alloy rings. These rings are welded to the steel pipe before coating, and the pipe is outside-threaded after coating. Material for the end rings must be selected to resist the corrosive medium, but only a small quantity is required. Other improvements have been made in the design of glass-lined flanges, expansion joints, cast iron fittings, and field-cut pipe spacers.

Development of a new fabricating technique has made economically feasible the manufacture of intricate shapes in glass. A typical example is the bubble-cap distillation column; all-glass columns up to 24 in. in diameter can now be built. The method used is known as the multiform process. High-silica glass is molded, like clay, into the desired shape, which is then fired. The resulting article is opaque, but it has the corrosion resistance and other desirable properties of glass.

A new process recently put into plant-scale use for the production of fused stabilized zirconia has achieved economies which bring this high-temperature refractory within the range of commercial prices. Zirconia can be used to contain process atmospheres up to 4,700 deg. F., hundreds of degrees above the upper limit of previously available commercial refractories.

Pure zirconia is of little use as a commercial refractory. It undergoes a phase transformation at about 1,800 deg. F., accompanied by a drastic volume change which ruins its mechanical structure upon cooling. In stabilized form, however, it is capable of withstanding many heating and cooling cycles. Stabilization results from addition of 5 percent CaO.

Present and potential applications of zirconia refractories are in the thermal fixation of atmospheric nitrogen, cracking and reforming of hydrocarbons, melting and sintering of refractory metals, and as resistors for high-temperature resistance and high-frequency electric furnaces.

In keeping with the tradition of the chemical industry as being its own best customer, the use of plastics in process equipment is rapidly accelerating. Polyethylene, for example, is being made in a variety of new forms, such as tank linings, drum linings, pipe, tubing, and now even solid polyethylene valves. A new blow molding process, details of which are still under wraps, is used to make all sizes and shapes of bottles up to 2 gal.

Other plastics are being made into pipe and fittings which can be cut, threaded, and field assembled by conventional means. One manufacturer uses a vinyl polymer, and another uses a combination of butadiene-styrene plastic with acrylic rubber. These materials are much tougher than plastic pipe formerly available, while maintaining a fair degree of rigidity. Pipe and fittings are regularly made in sizes up to 2 in. In addition to the all-over corrosion resistance of plastic pipe, resisting attack both to fluids on the inside and atmosphere or drips on the outside, another important advantage is light weight—the new materials weigh a small fraction of the weight of steel.

All-plastic fume hoods, ducts, and flumes can now be obtained. They have no metal parts at all, not even fastenings. Flanges and corner strips, bolts, rivets, and other parts are all made of the same corrosion-resistant composition.

A new material of construction based on modified phenolic resins has shown remarkable life in cases where other materials failed in short order. For example, pumps lined with this material handled a combination of sulphuric and hydrofluoric acids at 160 deg. F. about 12 times longer than any special metal or alloy previously used.

Known as Kemplas, this material is suitable for operating temperatures to 350 deg. F. and is resistant to virtually all except highly oxidizing acids. Equipment may be either cold cast or laminated with glass cloth and molded into desired shapes. Valves, pipe, pumps, and other pieces of equipment are being made.

Synthetic fibers are making a place for themselves in the form of work clothing for chemical plant operators. Chief among these are Dynel and Orlon, in the form of shirts, trousers, coveralls, and even dresses. Resistance to acids and solvents is excellent; they are affected somewhat by alkalis, depending upon the concentration.



DYNEL SHIRT resists acid attack. The other one was made of cotton.



RUBBER DRUM requires no vent; it collapses as liquid is withdrawn.



GRAPHIC PANEL uses specially developed miniature instruments.



BETA RAY GAGE measures thickness or weight per unit area of moving materials, such as metals, rubber and coated fabrics, without even touching them.

An interesting new application of rubber to the chemical industry's problems is a 55-gal. collapsible drum. It is made of tire cord fabric, impregnated with synthetic rubber and molded in one piece. The drum automatically collapses as liquid is withdrawn, requiring no venting. With the addition of a metal plate, it can be completely emptied from an overhead hanging position. More than 2,500 collapsed drums can be shipped in a standard railroad box car that would otherwise hold only 300 rigid drums.

Instrumentation

With big advances not far off, emphasis now is on electronics and analysis measurements.

Process instrumentation has been advancing rapidly, but the most important changes are evidently still a few years in the future. Although developments of the last decade have been moving in the direction of the automatic plant, the goal remains some distance away. In today's automatically controlled plant it is necessary to make manual adjustments of the instruments from time to time. In many cases it is necessary to blend batches or to average out variations in the product of a continuous process because we are not yet able to assure perfect uniformity. This comes partly from the inadequacies of present-day instrumentation. But in part it is because we are not yet able to build an intelligence into the control instrumentation which can substitute fully for the human operator. However, the tools for this are either here or are now under development.

One of the main tools is the automatic computer, another is the automatic analysis instrument. Still another is the improvement in instrumentation science that is beginning to take shape with the current exchange of thinking now occurring between the "servomechanism school" and those engineers whose background is in process instrumentation.

Tomorrow's automatic control will lean heavily on analysis instrumentation, much of which is now in process of emerging from the laboratory and going into the plant. As an example, infrared spectrometers are now being built for plant use in analyzing hydrocarbon streams. In recent instances, although still experimental, mass spectrometers, both of the leak detector type and tuned to a small range of mass numbers, have been used similarly for the continuous recording of plant stream analyses. Older types of analysis instrumentation are being improved, and previously unused properties from which the analysis can be inferred are coming into use. An example is an instrument depending on refractive index.

Automatic computers, which have been going through an intensive development period for purposes of mechanized computation, are now beginning to be considered also as components of control instrumentation. Whereas today's plant measures the various quality criteria of its product and then manually corrects back to the process control conditions, the automatic plant of the next decade will use computer-like instruments to make the necessary corrections. In a very general way this may be envisioned as the use of a computer which will receive data on operating conditions and on product quality and will then correlate the two sorts of data, judge how the operating conditions should be altered, and issue suitable instructions to the primary control instruments. When such instrumentation has been developed and applied we can anticipate better products from smaller plants running at full capacity, and much more efficient use of human attendance.

Apart from this longer term trend are others which have recently become notable. Electronics has made striking inroads in the last ten years or so with the result that many instruments today are virtually without open contacts or moving parts in their measuring circuits. One effect has been that some of the earlier predominance of pneumatic control has had to give way.

Another trend has been toward the use of graphic instrument panels, and with it the designing of miniature instruments to fit on such panels. One miniature instrument system offers the additional advantage of visual alignment of all the indicating pointers associated in a process, when all variables are being controlled at proper values. Thus any variable which is out of control can immediately be spotted on even casual inspection.

Among the newer sensitive devices used in instrumentation, the bonded wire strain gage has been going into numerous new applications, for example in measuring pressure or in controlling torque in rotating machinery such as centrifugals. One new imagination-stirring scheme that has emerged recently is industrial television, which permits the remote monitoring of inaccessible instruments or hazardous operations. There have been several new methods for viscosity

recording offered in recent months, as well as several new types of flow measuring device.

Radioactive substances have seen increasing use in measuring instruments, for example, as the gamma ray gage for level and wall thickness and as the beta ray gage for thickness of moving webs of material. A novel use of radioactive tracers has been to mark the boundaries between different materials as they are sent through the petroleum industry's product pipelines.

Mechanical & Electrical Energy

Gas turbines advance slowly, internal combustion gains new ground in process industries.

Gas turbine development has tended to settle down, except in the field of aircraft propulsion, where new information on construction materials is being discovered which eventually will be of enormous value in industrial equipment as well. The number of industrial gas turbines now in actual use is still relatively small, but many are on order. The bugs have largely been worked out, and builders are now able to provide workable equipment as a commercial proposition. Several of the gas turbine installations currently in use operate at 1,500 deg. F. in a regenerative cycle which means a thermal efficiency of 28-30 percent—not much below the efficiency of internal combustion engines. However, some of those burning fuel oil are having corrosion troubles which suggest that this temperature may be somewhat too high.

Work has been going ahead on the experimental coal-burning gas turbine of the Locomotive Development Committee. Here the chief problem has been the efficient removal of fly ash from the combustion gases so as to avoid erosion of the turbine blading. The committee reported last spring on the first 1,000 hr. of experimental operation. During the tests changes in the dust collection equipment were necessary from time to time since some of the ash was getting through. However, an arrangement was used during the latter part of the run which allowed negligible erosion and indicated that the problem had largely been solved. Current work is headed toward the testing of additional turbines.

Process industries, especially in the Southwest, have been showing increased interest in the internal combustion engine as a source of primary power. The most interesting and outstanding installation was that of the Aluminum Co. of America at the Point Comfort reduction works. Put into operation last year, the plant has 120 spark-ignition engines of a new type. Each is rated at 1,600 hp. and has 11 cylinders arranged in horizontal radial design. Natural gas fuel is burned at a thermal efficiency of 29-30 percent. Each engine has a direct-connected d.c. generator producing 1,000 kw. at 667 volts. Success of the project is shown by the fact that Alcoa is adding engines for two more pot lines, while both Kaiser and Reynolds have ordered engines for new reduction plants.

Electrochemical plants are not always in a position to produce their own prime d.c. power as do these aluminum plants, so that rectification equipment continues to be an important requirement. Something like 90 percent of all rectification in electrochemical plants is now handled by single-anode mercury arc rectifiers of the Ignitron type. However, within the last year it has become clear that a serious competitor to the Ignitron has developed in the form of the mechanical contact rectifier. In essence, this is a mechanical switch synchronized with the alternation of the current supply. First built in Germany during the early war years, this type of rectifier has been further developed in the United States. A large number of units have recently been installed or are now under construction, mainly for electrochemical use.

Aside from savings in weight and space compared with earlier equipment, the new contact rectifiers have a big advantage in offering high electrical efficiency at lower voltages. Suitable for voltages from 50 to 400, they make possible shorter cell lines than other rectifiers which must operate at up to 600 volts to secure comparable efficiency.



CONTACT RECTIFIER converts a.c. efficiently at low voltages.

Mechanical Power Usage

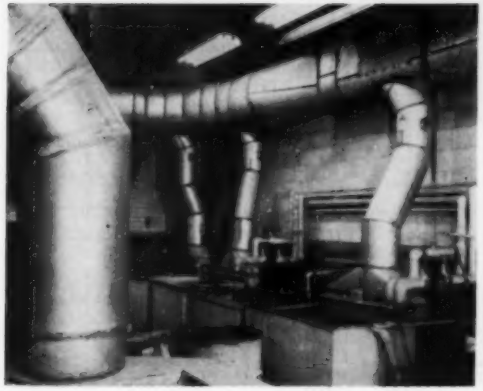
Clutches, transmissions, belts, chains and lubrication methods all share in developments.

In power transmission a number of newer ideas have made progress in the recent past. One of these is the magnetic particle clutch, originally a development of the National Bureau of Standards. Such clutches are now commercially available and offer smooth operation and high capacity in a relatively small piece of equipment. The principle here is that a mixture of iron powder and a lubricant offers little resistance between the driving and driven sides of the clutch as long as the iron is demagnetized. However, when current is passed through a winding in the clutch so as to form a magnetic field, the iron-lubricant mix becomes solid and acts as a solid coupling.

Fluid power transmission devices have also been coming into wider industrial use, including both the slip-clutch type and the variable-speed torque-converter type. One power transmission manufacturer, for example, now provides a motor with a built-in hydraulic clutch for non-overloading acceleration of the load.

Several improvements in mechanical transmission of power are of considerable interest. A leather transmission belt now on the market has rayon cord reinforcement sandwiched between the leather plies to eliminate belt stretch. Another new idea is a rubber belt which cannot slip because it is toothed and runs on special toothed pulleys, very much like a metal chain. Rather similar in effect, although not in construction, is a new metal chain belt which has teeth of sinusoidal shape, running over a sprocket of similar tooth form. Extra quietness and much higher belt speed are said to be possible with this design.

Most novel idea in the lubrication of mechanical elements to appear in many years is an oil-vapor system. This method makes use of atomized oil which is carried in an air stream to the point of application. Small tubes carry the vapor from the lubricator to a number of bearings. The oil remains in suspension until it precipitates as a film when it impinges on the bearing surfaces. The system uses an extremely small amount of oil, virtually eliminates lubrication labor, requires no measuring devices, and assures cooler bearings through air cooling and reduction in fluid friction in the bearing.



ELC steel welds the ducts in this electroplating plant.



Scarce steels were formerly used to prevent weld decay.

A Steel Shortage Overcome

Problem: Current needs for stainless steel for weldments.
Solution: Armco develops an alternate for allocated steel.

Extra-low carbon stainless steels, the chemical industry finds, is a good substitute for stabilized stainless steels. They are particularly valuable as a weldment for duct work, smoke stacks, piping, pulp digesters, processing vessels, acid tanks, and air-conditioning equipment.

The National Emergency has seriously limited the supply of stabilized stainless steel. Columbium, a stabilizing element, for example, cannot be used except for defense orders. Such restrictions have given many headaches to chemical designers, equipment, and probably many plant engineers. The problem, however, in a limited extent has been solved. Extra-low carbon stainless steels, which are relatively new materials, have proved good alternates for the stabilized steels. But they may not be used in temperatures above 800 deg. F.

Extra-low carbon stainless steels, or ELC, which is a registered trademark of Armco Steel Corp., Middletown, Ohio, have several notable qualities: (1) they prevent intergranular corrosion, (2) they have fabricating flexibility, (3) and they do not contain scarce alloys. They were first produced in 1945 by Armco. Since that time, they have found rather wide application in the chemical, pulp and paper, textile, and petroleum industries.

The ELC steels have an extremely low carbon content, a maximum of 0.03 percent. Their resistance to corrosion is due to the low carbon content. Intergranular corrosion, however, may occur if the metal is exposed to temperatures above 800 deg. F. The low carbon content has some effect on the strength, hardness, and ductility of ELC steels. The difference, however, between them and other low carbon steels, as the table shows, is small.

Recently the Boiler Code Committee of the American Society of Mechanical Engineers has issued a special ruling on the use of the extra-low carbon grades of austenitic stainless steels. This ruling, case No. 1122, permits the use of Types 304 and 316 containing 0.03 percent maximum carbon in unfired pressure vessels. Requirements for mechanical properties and maximum allowable working stresses are established in the Mechanical Engineers' ruling.

ELC steels have been used extensively and successfully in a wide variety of stainless steel weldments. They have fared better than standard counterparts, and as good as the stabilized steels. They have the same general weldability as their counterparts. The same techniques are used for jigging, control of distortion, rod and torch manipulation, and joint design.

Welded joints of ELC steels are sound, ductile, and have a high strength. Their properties differ slightly, but compare favorably, with those of the standard grades. Their ductility and impact strength is somewhat lower. But they have a slightly higher tensile and yield strength.

ELC welds simplify field repairs and fabrication. Standard grade steel weldments, in order to resist corrosion, have to be annealed at temperatures of 1,900-2,000 after welding. Annealing dissolves precipitated chromium carbide, putting chromium back into depleted grain boundary areas. The procedure is satisfactory for many stainless weldments; but it is impractical for large structures, in field repair or erection.

Before the development of extra-low carbon stainless steels, weldments that could not be annealed had to be made of stabilized steels. Field repairs also required the use of stabilized grades. The stabilized steels at the present time are not available. The ELC steels, however, are a better buy. They cost less. And for use in temperatures less than 800 deg. F., they are just as serviceable.

ELC steels now have an important place in the field of welded chromium-nickel stainless steel structures.

Typical Mechanical Properties of the ELC and Standard Grades of Chromium-Nickel Stainless Steels

Grade	Ult. Str., Psi.	Yld. Str., (0.2%) Psi.	Elong. % in 2"	Hardness Rock. B
Type 304	85,000	38,000	55	80
Type 304 ELC	80,000	32,000	60	77
Type 316	80,000	38,000	55	80
Type 316 ELC	79,000	35,000	55	73
Type 347	95,000	40,000	50	85

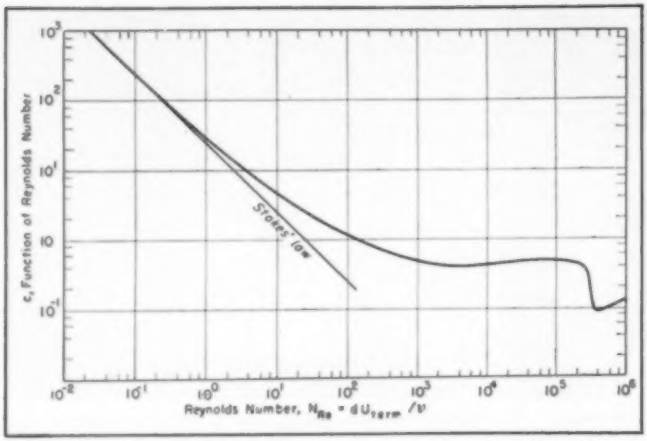


Fig. 1—Curve of c-function for a sphere shows peculiarity at a Reynolds number of 300,000 which means three different terminal velocities.

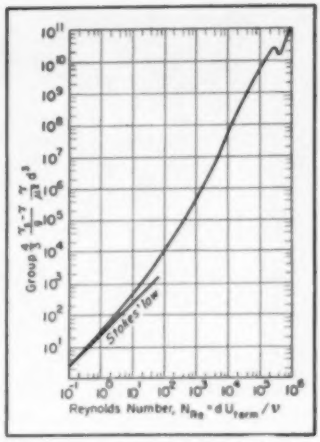


Fig. 2—Plot of group defined in Eq. (3) against Reynolds numbers.

How to Understand Problems of Terminal Velocity

All processes where solids must be suspended in a fluid involve the concept of terminal velocity. The concept is not generally well understood and can offer difficulties without proper data.

ARTHUR H. KORN

A body falling in a viscous medium such as air is accelerated by the force of gravity. The resistance offered by the viscous medium grows rapidly as the velocity of the falling body increases and soon equals the gravitational force. The moment equilibrium is attained the body continues to fall at a constant velocity, the so-called terminal velocity.

In pneumatic conveying, dust collecting, air classifying, fluidizations—in fact in all processes which depend on solid matter being kept freely suspended in a fluid—a knowledge of terminal velocities is of utmost importance. An up current can raise a solid body only if the fluid velocity is greater than the terminal velocity of the solids.

The air resistance F under turbulent flow conditions, as encountered in pneumatic conveying, varies approximately in direct proportion with the cross-sectional area A of the moving body, and as the square of its velocity U. This law, which was promulgated by Sir Isaac Newton, is generally written in the form

$$F = c\,A\,\rho\,U^2/2 \qquad (1)$$

were ρ is the density of the fluid. Dependency of the resistance on the density of the fluid seems plausible. It has been found that the factor c is not a constant but a function of the so-called Reynolds number:

$$N_{Re} = d\,U/\nu = \gamma\,d\,U/g\,\mu \qquad (2)$$

where d is the diameter of the body and $\nu = \mu g/\gamma$, the kinetic viscosity of the fluid in which the body moves. Through extensive wind tunnel tests the c-functions have been established for a number of shapes such as spheres, cylinders and disks. Although not very well known, these c-graphs can be found today in the aerodynamic section of almost any handbook on engineering. The c-curve of a sphere is reproduced in Fig. 1.

In spite of this, for anyone who has not familiarized himself with the subject and does not have the proper textbooks at hand, calculation of terminal velocities will prove a time-consuming operation, full of uncertainties.

Only for spheres can the terminal velocity be determined with accuracy from the resistance curves. This is because a body of any other shape has a tendency to tumble and rotate while falling, a condition under which the established c-functions are not applicable.

NOMENCLATURE

A	=	Cross-sectional area, sq. ft.
c	=	Dimensionless function of Reynolds number.
d	=	Diameter of sphere, ft.
μ	=	Absolute viscosity, (lb.-sec.)/ft.^{2}
F	=	Resistance, lb.
g	=	Gravitational constant, ft./sec.^{2}
γ	=	Specific gravity of fluid, lb./cu. ft.
γ_s	=	Specific gravity of sphere, lb./cu. ft.
ν	=	Kinematic viscosity, ft.^{2}/sec.
N_{Re}	=	Reynolds number, dimensionless.
ρ	=	Density of fluid, (lb. force-sec.)/ft.^{4}
U	=	Velocity, ft./sec.
U_{term}	=	Terminal velocity, ft./sec.

ARTHUR H. KORN *is chief engineer of the Airborne Conveyors Corp., New York. Readers will remember him as author of the article on the mechanism of pneumatic conveying which appeared in our March 1950 issue.*

As soon as the terminal velocity is attained the resistance equals the weight of the sphere, minus the weight of the displaced fluid, thus:

$$\frac{\pi}{6} d^3 \gamma_s - \frac{\pi}{6} d^3 \gamma = c \frac{\pi}{4} d^2 \frac{\rho}{2} U_{term}$$

This multiplied by $8\gamma/\pi g\mu^2$ gives

$$\frac{4}{3} \frac{\gamma_s - \gamma}{g} \gamma \frac{d^3}{\mu^2} = c \left(\frac{\gamma}{g} \frac{d\, U_{term}}{\mu} \right)^2$$

or

$$\frac{4}{3} \frac{\gamma_s - \gamma}{g} \frac{\gamma}{\mu^2} d^3 = c\,(N_{Re})^2 \qquad (3)$$

In case the solid falls in a gas the specific gravity γ of the gas is small compared with that of the solid γ_s and can be neglected as far as the difference γ_s-γ is concerned, so that

$$\frac{4}{3} \frac{\gamma_s}{g} \frac{\gamma}{\mu^2} d^3 = c\,(N_{Re})^2 \qquad (4)$$

The product $c(N_{Re})^2$ (or its equivalent group of variables) as determined from the wind-tunnel tests is shown in Fig. 2 on a Reynolds number base. These tests cover a range of Reynolds numbers from 10^{-4} to 10^6.

For smaller Reynolds numbers for which laminar flow conditions prevail, G. G. Stokes (who determined the resistance of a sphere by mathematical analysis) found that:

$$F = 3\,\pi\, d\, \mu\, U \qquad (5)$$

When the terminal velocity is reached this resistance again equals the weight of the sphere, minus the weight of the displaced fluid, thus:

$$3\,\pi\, d\, \mu\, U_{term} = \frac{\pi}{6} d^3 (\gamma_s - \gamma)$$

or

$$U_{term} = \frac{1}{18} \frac{\gamma_s - \gamma}{\mu} d^2 \qquad (6)$$

If multiplied by $24\ \gamma d/g\mu$ to obtain the same group of variables as in Eq. (3):

$$\frac{4}{3} \frac{\gamma_s - \gamma}{g} \gamma \frac{d^3}{\mu^2} = 24 \frac{\gamma}{g\mu} d\, U_{term}$$

or

$$\frac{4}{3} \frac{\gamma_s - \gamma}{g} \frac{\gamma}{\mu^2} d^3 = 24\, N_{Re} \qquad (7)$$

Stokes' law holds true for Reynolds numbers from 10^{-4} to 10^{-1}. This is indicated in Fig. 1.

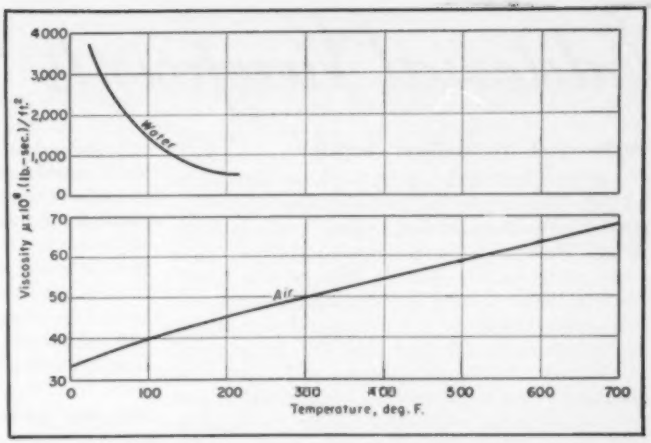


Fig. 3—Absolute viscosities of water from 32 to 212 deg. F. (upper curve) and air from 0 to 700 deg. F. (lower curve).

To find the terminal velocity of a sphere of given diameter and specific gravity, which is falling in a fluid of given specific gravity and absolute viscosity, it is necessary to determine the value of the group

$$\frac{4}{3} \frac{\gamma_s - \gamma}{g} \frac{\gamma}{\mu^2} d^3$$

If the fluid is air or water, the absolute viscosity can be taken from Fig. 3. For the value obtained for the foregoing group Fig. 2 will give the Reynolds number at which the sphere is in equilibrium. The terminal velocity is then, according to Eq. (2):

$$U_{term} = \frac{g\,\mu}{\gamma\, d} N_{Re} \qquad (8)$$

Table I, which applies to air of atmospheric conditions, enables one to know at a glance the approximate magnitude of the terminal velocity and its variation with the diameter of the sphere and its density.

Due to a pecularity of the c-curve at $N_{Re} = 300{,}000$ a given sphere may have three different terminal velocities. This is the case when the value of the group lies between 1.3×10^{10} and 2.7×10^{10}, or where values of the Reynolds number lie between 170,000 and 510,000. In an ordinary fall the sphere will attain only the lowest of the three velocities. In pneumatic conveying, however, the sphere attains equilibrium at the highest of the three velocities. The sphere is raised by an up-current. The slip velocity, that is the velocity by which the sphere lags behind the fluid velocity, is greatest at the start and gradually diminishes until the minimum slip velocity is reached. This is equal to the highest of the three terminal velocities.

The sudden drop in resistance, that is, of the drag coefficient c of a sphere, at $N_{Re} = 300{,}000$ provoked much discussion when it was discovered, but Schiller states that no satisfactory explanation of the phenomenon has been offered.

The curves and equations given are applicable not only to the free fall of spheres under gravitation, but also under centrifugal acceleration. The acceleration taking place in centrifuges, centrifugal equipment in general, and even in ordinary cyclones, is usually expressed as a multiple of that due to gravitation. Since the force that accelerates a sphere is a multiple of its weight, it is only necessary to substitute a multiple of $\gamma_s - \gamma$ for this expression in Eqs. (3) to (7). It is important to note that the terminal velocity thus obtained is the velocity of the sphere relative to the fluid. The fluid itself may have a velocity in the same or opposite directions, or at right angles or any other angle to the terminal velocity.

Table I—Terminal Velocities of Spheres Falling in Air

(Velocities in ft./sec. in air at 68 deg. F. and 29.92 in. Hg barometer)

Diam. of Sphere, Micron	Diam. of Sphere, Inch	Material and Specific Gravity: Hollow Sphere, 0.1	Cork, 0.25	Water, 1.00	Glass, 2.6	Steel, 7.86
1	0.000 04	0.000 01	0.000 02	0.000 10	0.000 26	0.000 78
10	0.000 39	0.000 99	0.002 48	0.009 95	0.025 90	0.078 4
100	0.003 94	0.090 3	0.225	0.784	1.86	4.41
1,000	0.039 37	2.85	5.52	12.6	23.0	42.5
10,000	0.393 70	17.6	27.4	53.8	83	177
100,000	3.937 01	48.9	79.8	333	610	800

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Editorial Viewpoints

Dedicated to Selfless Service

When Merck & Co. decided to honor three of its research chemists for brilliant work that had made possible cortisone, antibiotics, vitamins and sulfa drugs, it faced a subtle, almost metaphysical, problem. How could a value be put upon the fruits of their labors? For who could measure their contributions to man's fundamental knowledge or the surcease their researches had brought to his sufferings? How then reward them?

Happily, Merck's management found a way. The grateful company made it possible for each of these men to enrich the stream of human knowledge by setting up scholarships and lectureships at the very universities where he himself had first come to a knowledge and love of chemistry. Accordingly, Merck established its Board of Directors' Scientific Award and, to this end, provided $75,000 to be directed by the three chemists.

Youthful Dr. Lewis Hastings Sarett, whose partial synthesis of cortisone led to the present process for its manufacture, set up two annual scholarships in chemistry, one at Princeton and the other at Northwestern, each to go to an outstanding senior. Sarett was graduated from Northwestern with Phi Beta Kappa honors in 1939, and received his master's degree and doctorate at Princeton, working there from 1939 to 1942 with Prof. Everett S. Wallis on the bromination of steroid hormones. Dr. Sarett this year received the Baekeland Award from the North Jersey Section of the American Chemical Society and the Award of Merit from the Northwestern Alumni Association.

With his award, Dr. Karl Folkers, who graduated from the University of Illinois in 1928 and received his Ph.D. from the University of Wisconsin in 1931, established lecture series in chemistry at both schools. Dr. Folkers achieved recognition for his work on antibiotics and important vitamins. During World War II he directed intensive research on penicillin for the National Defense Research Committee. His work on vitamin B_6 and vitamin B_{12} culminated in the isolation and characterization of crystalline B_{12} in 1948.

Dr. Max Tishler, associate director of research and development for Merck, has established a lecture series in organic chemistry and biochemistry at Harvard University and an annual scholarship in the sciences, preferably in chemistry, for a senior at Tufts College. Dr. Tishler graduated from Tufts in 1928 and got his doctorate from Harvard in 1934. He has been in charge of the development of many Merck processes for the production of antibiotics, vitamins, sulfa drugs, alkaloids, amino acids, steroids and others. He was one of four Merck researchers who developed a new method for making cortisone.

And so Merck has found a way to honor and indirectly reward these men whose creative research means so much to mankind. It has found a way to stimulate youthful initiative, mature judgment and dedicated intellect among its research workers. And it may have found a lasting way to stimulate comparable contributions in the future. For who knows what discoveries in chemistry will be made by the young men who will come to the laboratories and lecture halls of these six famous universities, thanks to the Merck awards?

Biggest Grows Bigger

More chemicals are consumed in fertilizer manufacture than in any other division of chemical process industries. Several factors contribute significantly to further growth of this "biggest user."

First and most obvious is the continued increase in fertilizer consumption by American agriculture. Despite a doubling of plant food consumption in recent years, this growth seems certain to continue.

Now entering as an important new factor is the concept of pasture farming. It is evident that feed for dairy herds and feed for meat animals, both cattle and others, can be achieved more economically by the farmer through pasture fertilization and great increase in the use of chemicals on the farm. The present cautious development of pasture farming seems to be leading us into greatly increased use of fertilizers and pest-control chemicals.

Now comes still another need for greater chemical engineering effort in the fertilizer industry itself. Already chemical enterprise is supplying the potash and almost all of the nitrogen materials for fertilizer mixing. Only the making of superphosphate has continued in the many smaller fertilizer works of the country. On an empiric basis this acidulation is still done by rule-of-thumb and almost without chemical control. A strange new outside factor seems likely to put an end to this.

We refer to the need for recovery of uranium from phosphate rock before manufacture of superphosphate. This is likely to be a third and more important step in the complete development of modern chemical engineering for the preparation of materials used in fertilizer making. There will remain all of the present incentive for small local distribution centers which can give to each farm neighborhood the guidance and suppy service best suited to their local needs. But apparently we are going to have a much greater chemical engineering part in the phosphoric acid and superphosphate business as an important development in the next decade.

Ye Old Spanish Swindle

Have you heard recently from Sr. Pedro Ceballos of Mexico City? It seems the poor man has been jailed for bankruptcy, despite the fact that he has carefully cached a trunk full of U. S. currency which he would be glad to share with you—for a consideration. And there's a sick daughter involved, too, further to incite your sympathies and to assuage your conscience in case you have moral scruples against entering into Pedro's little plot.

So many of our chemical friends have been approached recently, we begin to think that Pedro has been using the new ACS directory for his sucker list. The typing of the present letter and the air-mailed envelope certainly have all the earmarks of mass production. Although the amount is different, the wording is identical with the first such letter we received at least five years ago. This time we turned the file over to the local postmaster and received his written assurance that the postal authorities "will do all they can to stamp (sic) out the thing you complain of."

A few days later word came from the Post Office Inspector in Philadelphia that the Postmaster General has been on the trail of Pedro and his many aliases for many years. Too often gullible Americans have been persuaded by these swindlers to take ransom money into Mexico, only to be relieved of it by trickery or violence. Fraud orders have been issued to impound U. S. mail addressed to any of the known names used by the swindlers. But so far the authorities have not been able to apprehend and punish those co-conspirators in the United States who furnish the lists and otherwise promote this fraudulent scheme. For the experience of others, see page 264.

Higher Gas Costs Coming

For some time quietly, now more conspiciously, the federal authorities have been intent on reducing the demand for natural gas for space heating. It has long been evident to engineers acquainted with the gas business that such restriction or control might ultimately be necessary. Since chemical industries are going to be involved as large fuel users, as well as producers, this is now a problem for the serious consideration of chemical engineers and executives.

Huge pipelines have been built to bring natural gas from Texas and nearby states to serve almost the entire area of the United States. Pipelines originating in the Lone Star State deliver gas to Boston and New England cities, to San Francisco and the West Coast and as far north as Minneapolis. The gas industry's wildest dreams of ten years ago have now been realized. But three sorts of troubles have developed, all of them important to us:

1. Increasing demand for gas in the producing areas has driven the price up rapidly. In some cases gas is now sold at the well for three to ten times as much as the same gas could command only ten or fifteen years ago.

2. Most of the pipelines have become interlocked with public utility distributing systems. This means that much of the customer load is at a very low capacity load factor. In many cities the unrestrained sale is resulting in 35 to 40 percent load factors, thus making the capital cost for transmission from 2½ to 3 times as much as would be the case for uniform load customers. Delivered gas prices threaten to become excessive.

3. Because these higher costs can often be passed on to the ultimate consumer in a utility system, there is danger that the more desirable chemical-industry customer will also be charged excessively or may find that he cannot get needed gas at all, even though his high load factor makes him almost invariably the most favorable customer from the standpoint of the pipeline systems.

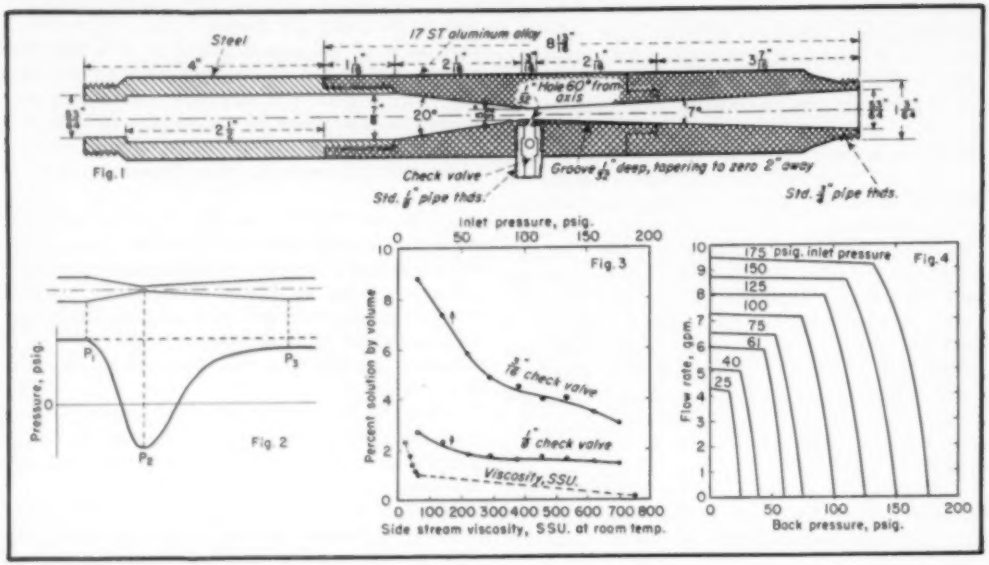
It is not feasible here to offer remedies for these three difficulties and their many variations. But there is both time and need for a word of warning to chemical management: it must get busy. It must soon demonstrate that the greatest public good from long-distance transmission of natural gas can come only from a combination of base-load industrial customers and a proper system of utility distribution in the urban areas. Without such a combination our irreplaceable natural-gas reserves are going to be dissipated wastefully for the benefit of none but a few exploiters of this great resource.

Time to Retreat?

For various reasons the gas industry in recent years has been getting rid of its manufacturing plants and has supplied whole utility systems with natural gas unmixed with manufactured components. In view of the developments to which we have just referred, it appears that the temporary financial advantage in such operations no longer exists. A strategic retreat is in order.

Unmixed natural gas can no longer be supplied at an economic price in utility systems of low capacity load factor. Added space-heating loads, especially for individual homes, creates a capital burden too great to be tolerated. They also make the manufacture of peak-load gas either impossible or excessively expensive.

Fortunately, a few big cities have been wise enough to retain the old city gas works for possible conversion to specialized gas manufacture. Those that have done away with these plant facilities are now confronted with the necessity of building new equipment and getting ready to supply part of the base load and most of the extra peak-load gas from these manufacturing plants.



How to Build a Venturi for Proportioning Service

P. L. Walker, Jr., and R. J. Foresti, Jr., *Instructor and Research Fellow, respectively, Division of Fuel Technology, Pennsylvania State College, State College, Pa.*

★ **September Contest Prize Winner**

To an increasing extent mixing operations are being handled on a continuous flow basis, which means that some form of proportioning device must be used. Commonly a pump will be used for this purpose, but in cases where power for the pump may not be readily available, another device such as a venturi may be preferable. A venturi derives the energy needed to draw in the second liquid (side stream), from the flow of the main liquid stream.

Venturis are commonly used as primary flow measuring devices where their small permanent pressure drop is an advantage. It has also been known for many years that if a hole is drilled into the throat at right angles to the flow, a strong suction can be produced (P_2 in Fig. 2) which permits the venturi to be used as a proportioner. Thus the idea of proportioning with a venturi is not new, but the particular design described here is novel and has advantages compared with earlier arrangements.

In investigating the production of spray and foaming agent solutions, the authors needed a continuous mixing device which would be accurate and dependable and could mix a few percent of agent into a main water stream. It was necessary that the device operate with a minimum of attention and be flexible enough to work at varying water pressures without adjustment. Also, it was necessary to obtain the greatest possible suction while keeping the pressure drop to a minimum. This meant introducing the secondary stream into the main stream in the venturi throat with a minimum disturbance of the flow pattern of the main stream. Otherwise distortion of the main stream would produce eddies and excessive friction in the

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★ October Contest Prize Winner

"How to Use an Intensive Mixer in Drying Rubber and Similar Materials."

A prize of $50 in cash will be awarded to Anthony P. Massa, project engineer and production supervisor, Stein Hall & Co., Long Island City, N. Y. The prize winning entry will appear in the December issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the November winner will be announced in December and his article published in January. Judges will be editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

diverging discharge portion of the venturi, thus increasing the pressure loss and reducing the suction.

The first effort at adapting a standard venturi by drilling into the throat at right angles was not very successful, owing to increased pressure loss and unreliable suction. Therefore, new venturis were designed in an attempt to avoid this disturbance. One design which proved eminently satisfactory is shown in Fig. 1. It was made of aluminum, for ease in machining and for lightness, with a connecting length of steel for strength in joining to the line. The approach and diffuser angles, of 20 and 7 deg. respectively, are the standard venturi angles. The important deviation from ordinary design lies in the throat. Here a gradual and smooth mixing of the two streams is achieved by putting the secondary intake hole into the throat at an angle of 60 deg. from the throat axis. This hole leads into a narrow tapering groove along the throat so that when the side stream is drawn into the recession, as it tapers to zero depth, the liquid mixes smoothly into the main stream. Performance shows a marked improvement compared with a standard venturi.

For cases where intermittent service is required, with a shutoff valve in the main stream after the venturi, a check valve can be installed in the side inlet as shown in the drawing. Or, if it is desired to vary the proportion of liquid admitted by the side inlet, a needle valve can be used instead of a check valve. Obviously, to enable the maximum proportion of side stream liquid to be drawn in, the side connection (and any valves installed in it) must be as large as can conveniently be accommodated. The effect of reducing the size of check valve is shown in Fig. 3. This chart shows both that there is a marked decrease in the percent of side stream that can be drawn in with the smaller check valve, and that for any size check valve the percent of side stream drawn in will decrease as the venturi inlet pressure and main stream flow increase.

Fig. 3 also shows the effect of varying viscosity of the side stream. The dotted curve is based on a venturi inlet pressure of 50 psig. and a main stream flow rate of 5.6 gpm. As the viscosity increases in the side stream, relative to water at 28.7 SSU. at room temperature, the suction rate decreases as would be expected, since the side stream liquid is in viscous flow in the ¼ in. intake line.

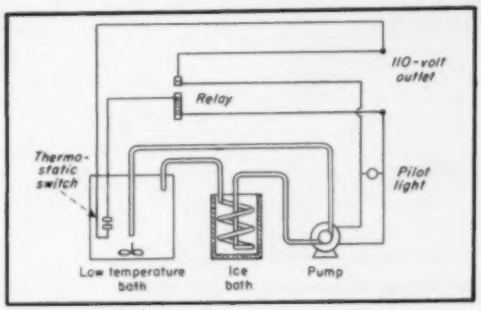
Another important feature of the proportioner is the constant flow rate obtainable over a considerable range of back pressure. Fig. 4 shows the effect on main stream flow of varying the back pressure for various constant values of the inlet pressure of the main stream. For each inlet pressure value the flow remains substantially constant until the back pressure reaches 75 to 80 percent of the inlet pressure. Also, over this range, there is essentially no change in suction rate. This means that, so long as the inlet pressure remains constant, there will be no change in the proportion of side stream mixed in, regardless of variations in the back pressure.

Hydrometer Cylinders Made Safe For Handling Corrosives

Otto A. Holstein, *Atlantic Refining Co., Philadelphia.*

Control of operations in a sulphuric acid plant requires hourly determinations of the Baumé specific gravity of acids of 93, 98 and 105 percent H_2SO_4 strength. In a recent accident with an ordinary hydrometer cylinder, the operator allowed the cylinder to slip through his gloved hand, so as to strike the lead work table and splash acid on his arm and face.

Although the burns were minor it was desirable to minimize the possibilities for future accidents of this sort. Therefore, we had the glassblowing section put a circumferential bulge in the center of the straight glass cylinder, and roughen the lower part of the cylinder by sandblasting. Modifying the standard cylinder in this way provides a positive grip without danger of slippage which is inherent in a straight-walled cylinder. The treatment does not interfere with the visibility of the upper section of the cylinder. So far as we have been able to determine, there are no hydrometer cylinders of this design commercially available.



Easily Constructed Water Bath Holds Sub-Atmospheric Temperatures

H. E. Payne and A. L. Minto, *Hollingsworth and Whitney Co., Mobile, Ala.*

Occasionally a need arises for a constant-temperature water bath below room temperature. This is especially true when checking viscosities and specific gravities. It was for uses of this sort that the writers devised the apparatus described below.

This bath is a relatively simple modification of the standard water bath for elevated temperatures. The thermostatic switch is connected in series with a relay coil, and the pump motor in series with the relay breaker points. If the bath temperature rises above the control point, then the thermostatic switch opens, thereby de-energizing the relay coil. This allows the relay points to close which starts the pump motor. In effect, this reverses the action of the thermostat as used for elevated temperatures. When enough water has been circulated to bring the temperature down to the control point, the action of the thermostatic switch breaks the pump motor circuit.

This particular apparatus maintains the water bath at a constant temperature within ±0.1 deg. C. when the temperature is as low as 5 deg. C. The control temperature can be reached faster if ice is added directly to the bath until the water temperature just approaches the desired point before starting the pump motor.

A Fenwal No. 17500 general-purpose Thermoswitch, with a range of −100 to +400 deg. F. is used. The pump delivers about 0.5 gpm. through 13 ft. of 3/16-in. copper tubing, coiled in 4-in. diameters. A 12 by 12-in. glass jar is used for the water bath while a well-insulated 6 by 8½-in. glass jar serves as the container for the ice bath. An electric stirrer in the bath insures an even temperature throughout.

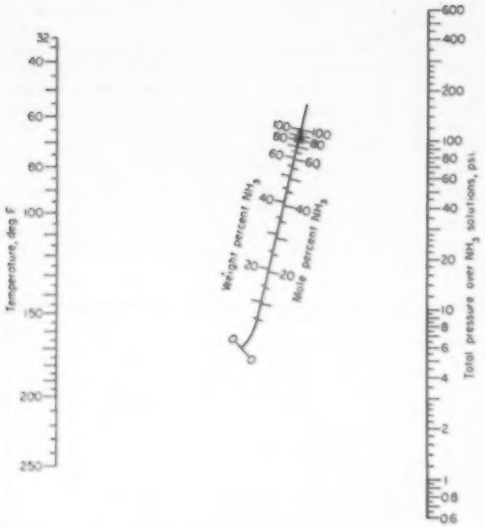


Chart Gives Total Pressures Over Aqueous Ammonia Solutions

D. S. Davis, *Virginia Polytechnic Inst., Blacksburg, Va.*

Wilson's data[2] that deal with the total pressures over aqueous solutions of ammonia for wide concentration and temperature ranges can be correlated very satisfactorily by means of the equation $P_m = aP_w^b$ where P_m = total pressure over the aqueous solution, pounds per sq. in.; P_w = vapor pressure of water at the same temperature; and a and b depend upon the concentration of ammonia as shown in the table:

Mole Percent of Ammonia	a	b	Temperature Range, Deg. F.
5	2.727	0.8463	32-250
10	4.224	0.8118	32-250
15	6.397	0.7809	32-250
20	9.727	0.7491	32-250
25	14.76	0.7180	32-250
30	22.12	0.6876	32-250
35	32.28	0.6602	32-250
40	45.68	0.6349	32-250
45	62.09	0.6129	32-250
50	81.08	0.5935	32-240
55	101.2	0.5763	32-220
60	121.1	0.5642	32-210
65	139.5	0.5536	32-200
70	155.5	0.5453	32-190
75	168.7	0.5384	32-180
80	179.2	0.5346	32-180
85	187.9	0.5313	32-180
90	196.4	0.5278	32-170
95	205.9	0.5239	32-170
100	218.8	0.5198	32-170

Since Wilson's data cover total pressure for solutions in steps of 5 mole percent of ammonia and in steps of 10 deg. F., there is evident need for a convenient graphical presentation that will permit close estimation of total pressure at any concentration and temperature within the ranges of the original investigation. The accompanying line coordinate chart, based on the tabulated values of a and b and constructed by methods described previously,[1] meets these requirements.

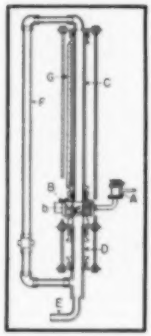
The use of the chart is illustrated as follows: What is the total pressure over an aqueous solution that contains 48 mole percent (46.6 weight percent) of ammonia at 85 deg. F.? A straight line connecting 85 on the temperature scale with 48 on the mole percentage scale can be extended to cut the total pressure scale at the desired value of 55 psi. What is the weight percentage of ammonia in an aqueous solution that exerts a total pressure of 38 psi. at 125 deg. F.? A line connecting 125 on the temperature scale and 38 on the total pressure scale intersects the concentration scale of 30 weight percent (31.2 mole percent) of ammonia.

REFERENCES

1. Davis, D. S., "Empirical Equations and Nomography," Chap. VII, McGraw-Hill Book Co., Inc., New York (1943).
2. Wilson, Univ. Ill., Expe. Sta. Bull. 146.

Removable Orifice Improves Operation Of Head Type Flowmeter

I. Bergman, *Chemical Engineer, Klipfontein Organic Products, Chloorkop P. O., Johannesburg, South Africa.*



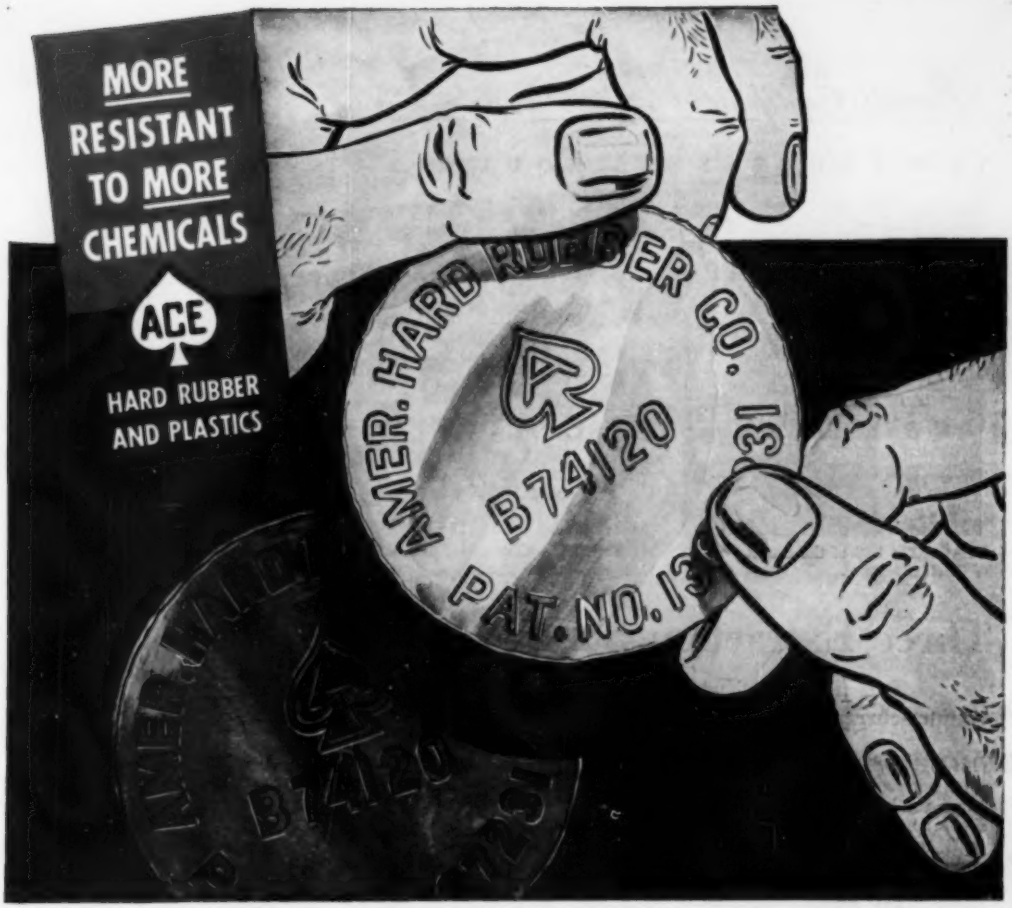
During the course of some pilot plant investigations it became necessary to meter accurately some very low continuous benzene flow rates, in the order of 0.3 gph. As no suitable rotameter or other meter was available locally, we designed and installed a flowmeter of the "niveau" type. This type, of course, depends on a head of liquid over an orifice of determined size. Varying the head alters the flow rate accordingly. The flow is a function of the square root of the head. By plotting head against flow on log-log paper or by using linear ordinates and squared abscissas, a straight line is obtained.

The required orifice size in this case was about 0.025 in. and this was drilled into a plate. However, we experienced constant difficulties with blocking or partial blocking of this small orifice.

We found that the task of removing and re-installing the orifice plate caused much inconvenience and unduly long interruptions in the continuity of the process. It became necessary to re-design the meter so that the metering element could be removed, cleaned and reassembled by the operator in a minimum of time.

The design adopted is shown in the diagram. For the orifice plate a plug cock B was substituted. Into the hole of the plug a plate b was welded, drilled for a 0.025 in. diam. orifice. Benzene from a head tank passes via needle valve A through a hole drilled into the body of the plug cock, and through a mating hole at the center of the plug just above the orifice. When cleaning of the orifice becomes necessary, all that is required is to remove the plug, clean and re-insert the orifice. This operation requires only a few minutes.

A description of the rest of the meter follows: Part C is a 1-in. sight glass tubing, fitting into a gland on the upper part of B. The liquid level is maintained in this sight glass and its height above the orifice read on scale G. It fits into another gland at the top end, the total height being made to suit the flow range required. A similar smaller sight glass D is fitted below B, to observe the stream passing through the orifice. One can therefore tell at a glance whether the orifice is perfectly clear or not. The section E delivers the liquid to the plant, while F is a balancing pipe to equalize pressures above and below the orifice.



A CRAFTSMAN SIGNS HIS WORK

SOMEWHERE in every ACE rubber-protected tank you'll find this seal. It's embossed into the rubber by a skilled American Hard Rubber Company lining craftsman just before the tank goes into the vulcanizer.

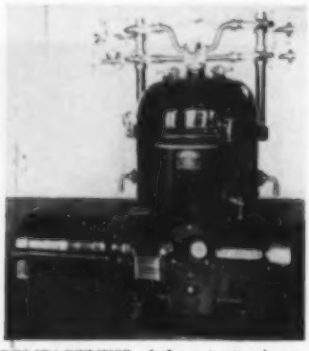
The serial number tells the age, and an amazing number of old ACE tanks are still in service after years and years of trouble-free handling of acids and alkalies.

The laboratory-controlled quality of the rubber and the ACE two-layer lining process (shock-resistant soft rubber plus chemical resistant hard rubber) get part of the credit. No less important is the craftsmanship of the men who cement the bond—the men who roll the perfect seams—the men who "sign" the quality tank linings. Result: extra years of service, and lowest cost-per-year.

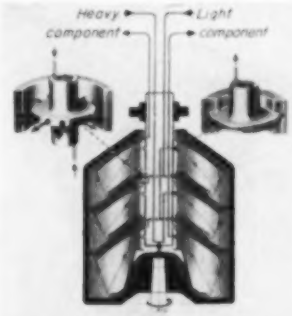
ACE rubber-protected tanks, pumps, valves, piping and special equipment are available for handling almost any acid or alkali. ACE Saran and polyethylene pipe and fittings also available. *Ask for catalogs.*



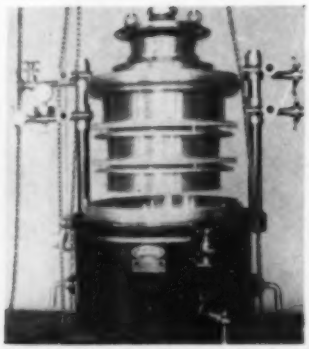
NEW PROCESSING EQUIPMENT



COMPACTNESS of the extractor is one of its chief features.



SECTIONAL VIEW shows paths of the fluids through the stages.



BOWL INSET can be removed, cleaned and replaced in an hour's time.

Three Extraction Stages in One Machine

This new centrifugal extractor provides multi-stage counter-current action, takes up little space.

(186A) The Luwesta extractor, a new device for liquid-liquid extraction, combines three stages in a single apparatus. It employs centrifugal force to successively contact and separate the solvent and raffinate, using counter-current flow between stages. The machine resembles a centrifugal cream separator, from which it evolved.

The bowl of the machine is driven from below at 3,800 rpm.; the central pipe, suspended from above, remains stationary. Appropriately designed channels in the central pipe provide for gravity feed of liquids and direct the flow of solvent and raffinate from one stage to the next. Driving force for the flow of liquids comes, of course, from the centrifugal force developed by rotation of the bowl. The liquids discharge from the machine at pressures up to 35 psi.

The light liquid is fed to the uppermost stage, the heavy liquid to the bottom stage. Mixing of the liquids occurs in the lowest stage by means of a spray disk. In the two upper stages mixing is effected by simultaneous collection of both liquids by one skimming disk. The use of skimming disks represents a major advance in the design of centrifugal extractors. They permit non-foaming, gas-free tapping, as well as a saving of power.

Throughput capacity of the machine depends on the type and ratio of the various liquid components, but the maximum is about 1,300 gal. per hr. of total liquid. The bowl is about 21 in. in diameter; over-all height is 55 in. Power consumption is 12 kw. All parts which come in contact with the liquids are made of Type 316 stainless steel.

The bowl provides a space of 5.6 gal. for collection of solids. This permits you to handle liquids containing solids or, as in the recovery of acetic acid in cellulose acetate manufacture, liquids from which solids are precipitated during extraction. Solids are easily removed by dissembling the machine and cleaning the bowl. The entire time required for cleaning, from shutting down to starting up again, is said to be only one hour.

The Luwesta extractor has been tested extensively in the recovery of acetic acid from the manufacture of cellulose acetate by extraction with ethyl acetate. The acetic acid from the process contains small quantities of dissolved cellulose acetate. As soon as the acid is extracted from the aqueous phase, the cellulose acetate precipitates, fouling up ordinary continuous extractors. It previously has been necessary, in order to overcome this difficulty, to hydrolyze the cellulose acetate with H_2SO_4 at higher temperatures or to distill the acetic acid from the impurities. Pretreatment is no longer necessary when using the Luwesta extractor; the precipitated acetate forms a deposit in the drum, which needs to be cleaned out only once every 48 hr.

This machine is well suited to the recovery of penicillin from its culture medium by solvent extraction. It minimizes the time of stay of the penicillin in the acidified aqueous filtrate.—*Centrico, Inc.*

Equipment Cost Indexes

(Marshall and Stevens Indexes of Comparative Equipment Costs, 1926 = 100)

Industry	Sept. 1950	June 1951	Sept. 1951
Average of all.....	171.5	180.9	179.1
Process Industries			
Cement mfg.	163.4	173.1	171.5
Chemical	171.4	181.1	179.5
Clay products	158.4	168.1	166.5
Glass mfg.	161.5	171.2	169.6
Paint mfg.	164.7	174.4	172.8
Paper mfg.	165.0	174.7	173.1
Petroleum ind.	167.8	177.5	175.9
Rubber ind.	170.2	179.9	178.3
Process ind. avg....	168.9	178.5	176.9
Related Industries			
Elec. power equip..	173.0	182.7	181.1
Mining, milling	172.1	181.8	180.2
Refrigerating	190.8	200.5	198.6
Steam power	160.1	170.3	168.7

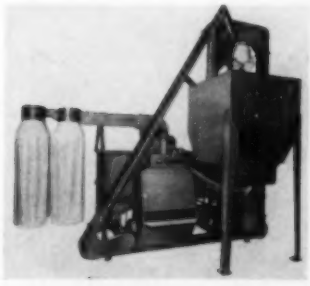
Compiled quarterly for March, June, September, and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1951, p. 158.

Liquid Storage Tank Uses Diaphragm Breathing

(187A) The Diaflote, a new development in cylindrical, flat-bottom storage tanks, is equipped with a flexible impervious membrane, attached to the shell of the tank and shaped to fit the inside wall and bottom of the tank. This membrane rests on the surface of any liquid stored in the tank, providing a tight barrier between the liquid and the air space above the membrane. The membrane is normally made of a synthetic film material known as Vulcalock, developed specifically for this application by the B. F. Goodrich Co.

The new tank combines the advantages of floating-roof and variable-volume tanks without the use of any mechanical devices which might require repair or maintenance. Operation is not affected by wind, rain, snow, or other weather factors, nor by unequal settlements of the tank foundation which might cause tilting of the tank.

Diaflote tanks are useful for the storage of volatile liquids, high-purity products which must be protected from atmospheric moisture or impurities, deaerated products, flammable liquids, and liquids which become corrosive through the action of moisture and oxygen. They are built in capacities to 100,000 bbl. Existing tanks can be easily converted to Diaflote tanks.—*Hammond Iron Works.*



Blending Unit For Field Processing

(187B) The R.T.R. Uni-Blendor is designed to mix and blend one or more concentrates with diluents for field processing of insecticides. It meets the need of a trend toward mixing of finished, field-strength products at the point of consumer demand. This trend is based on the advantages to the user of lower inventories, reduced deterioration in storage, and tailor-made formulations.

The equipment consists of a cut-in hopper with brush sifter and dust hood, continuous flow elevator, 40-cu. ft. ribbon mixer, spout magnet, micro blender, holding bin, automatic valve bag packer, and dust control system with exhaust fan and filter. With the unit you also get an electrical control panel, motors, drives, drive guards, gates, spouting, and wiring. A liquid

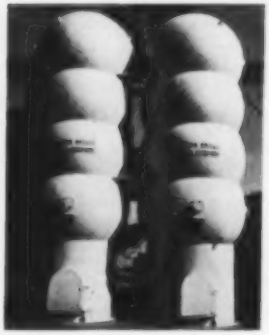
IN BRIEF—A capsulated listing of this month's newsworthy equipment.

		Page
Processing Equipment		
Centrifugal Extractor	Three counter-current stages in one machine	186A
Liquid Storage Tank	Flexible diaphragm protects contents, breathes	187A
Blending Unit	For field processing of insecticides	187B
Pressure Storage Vessel	Unusual construction saves steel and space	188A
Fluid Energy Mills	Formerly rented, can now be purchased	188B
Electronic Air Cleaner	Packaged units simplify installation	188C
Miniature Pulverizer	Junior edition of plant-scale machines	188D
Solids Washer	Washes, dewaters and conveys	188E
Packaging and Handling Equipment		
Shaker Conveyor	Design allows for expansion with hot materials	190A
Bag Packer	Accuracy to ounces is built in	190B
Fork Truck Assembly	Converts standard carriage into side-shifting	190C
Spur-Gear Hoist	Incorporates new design innovations	190D
Motor-Driven Trolley	Improvements result from hydraulic coupling	190E
Automatic Packer	For granular and powdered materials	190F
Overlapping Drum Ring	Eliminates the gap between ends	190G
Heating and Cooling Equipment		
Air Quenching Cooler	Design changes reduce maintenance costs	192A
Heat-Transfer Equipment	For liquid-phase heat transfer up to 800 deg. F.	192B
Insulation Band	Corrugated strap maintains constant pressure	192C
Continuous Belt Furnace	For small-scale ceramic firing jobs	192D
Materials of Construction		
Alkali-Resistant Glass	Threefold increase in life up to pH 12	194A
Hard-Facing Rod	Resistant to abrasion, impact and corrosion	194B
Reinforced Plastic Sheet	Polyester platsic is reinforced with glass fiber	194C
Metal-Surfaced Plastics	Sheets may be metallized on one or both sides	194D
Clad Steel Finishes	Now available with new polishing installation	195A
Aluminum Welding Rods	Flux coating eliminates dark weld deposits	195B
Polyethylene Valves	Will fit into standard piping systems	196A
Polyethylene Bottles	Blow-molded in sizes to 2 gal	196B
Electrical and Mechanical Equipment		
Metallizing Guns	Highest spraying speeds for hand-held operation	197A
Turbo-Generators	New cooling technique increases ratings	197B
Compressed Air Filter	Large cooling surface assists condensing	197C
Nylon-Lined Bearings	Allow for expansion and moisture absorption	197D
Steam Cleaning Unit	Has two steam guns and a water gun	197E
Electric Motors	Largest ever built for pipeline pumping service	197F
Labeling Tape	Acetate film is water and smudge-proof	198A
Vacuum Sweeper	Driven by air-cooled engine	198B
Selenium Rectifiers	Large cells permit assemblies of 50 kw	199A
Visual Aid System	Magnetic devices plus magnetic steel board	199B
Vapor Purifier	Removes moisture and entrainment in two stages	199C
Waterproof Labels	Cotton fabric with pressure-sensitive adhesive	199D
Instruments and Controls		
Temperature Regulator	Can be changed from direct to reverse-acting	200A
Level Switch	Disregards viscosity, conductivity or foam	200B
Control Valves	New trim for reduced valve capacities	200C
Temperature Controller	Combines maintenance control with limit control	200D
Electronic Manometer	Measures very small pressure differences	200E
Electronic Control System	Eliminates transmission lags	201A
Purge Meter	Bored from block of acrylic plastic	201B
Control Unit	Adjustable to process lags, eliminates hunting	202A
Weight Transmitter	Pneumatic scale for remote control	202B
Mercury Trap	Recovers mercury blown from manometers	202C
Cupcase Thermometer	For sampling at various storage tank levels	202D
Fluids Handling Equipment		
Roof Ventilators	Built in four easy-to-assemble sections	202E
Swivel Joint	Packless, uses lapped ball-and-socket seal	202F
Self-Priming Pump	No recirculation losses, no cut-off valves	202G
Relief Valve	Accurate control on 2 psi. pressure	202H
Plug Valve	Teflon liner replaces packing and lubricant	203A
Process Pump	With oil-lubricated bearings	203B
High-Pressure Pumps	Constant delivery up to 5,000 psi	204A
Hose Couplings	Connect tank truck hose to faucet	204B
Glass Pump	Larger size rated at 1,000 gal. per hr	205A

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers

injection system required for the addition of such materials as nicotine and Parathion can be provided at additional cost.

The complete unit requires only 9x12 ft. of floor space and 13 ft. of head room. Depending upon local conditions, up to 4 batches per hr. can be produced in the standard Uni-Blendor. Other models provide higher capacities and more complex processing sequences.—*A. E. Poulsen & Co.*



Pressure Vessel Built of Spherical Lobes

(188A) The Horton Multisphere is a new type pressure vessel made up of two or more spherical segments. Where each pair of segments meet, flat transverse internal diaphragms welded to the shell absorb the component of stresses. Holes through the center of the diaphragms permit communication between lobes.

Spherical vessels, as is well known, will withstand twice as much pressure as will a cylindrical vessel of the same wall thickness. So will Multispheres. Spheres, however, will not always fit into the available space. This is where the Multispheres come in.

Each of the nitrogen storage vessels pictured above has a capacity of 700 cu. ft. Over-all dimensions are about 7½ ft. dia. by 22 ft. high. Thickness of shells and diaphragms is 0.72 in.; working pressure is 400 psi. The vessels are built in accordance with code requirements. Although shown in a vertical position, they could also be installed horizontally. — *Chicago Bridge & Iron Co.*

Fluid Energy Mills Can Now Be Purchased

(188B) Fluid energy mills, formerly available only on a rental basis, can now be purchased outright. The new sales policy eliminates the necessity for users to reveal confidential production tonnage figures.

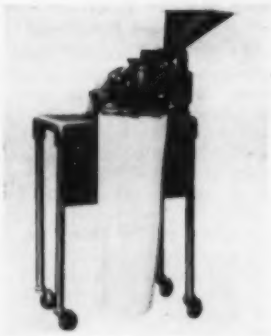
These mills, described in detail on p. 142 of our February 1950 issue, are based on the principle of fluid energy attrition. They are used for grinding solids to sizes in the micron range. Cost of grinding for the majority of products is said to be from $2 to $10 per ton, depending on grindability of the material and fineness desired. Figures include power, labor, and maintenance.

Mills are currently available in two sizes. Model 0405 is rated at 200 to 1,800 lb. per hr., and Model 0808 is rated at 400 to 6,500 lb. per hr.—*C. H. Wheeler Mfg. Co.*

Electronic Air Cleaner Comes in Package Units

(188C) You can now get a Precipitron electronic air cleaner as a complete packaged unit. Everything you need for assembly and installation of the unit is provided in prefabricated, factory-matched parts. Although size and weight considerations require that these units be shipped disassembled, highly skilled labor is not required for assembly, according to the manufacturer.

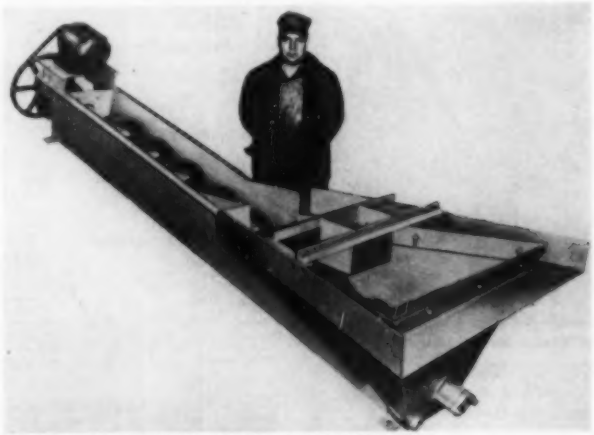
Rated capacities range from 8,000 to 44,000 cfm. The smallest size is 8x5x5 ft. and weighs 2,000 lb. The largest is 8x10x11 ft., weighing 4,800 lb.—*Westinghouse Electric Corp.*



Miniature Pulverizer For Lab and Pilot Plant

(188D) The Pulvette, a small pulverizer suitable for laboratory and pilot plant work, will perform the same degree of grinding as its larger relatives, the Pulva-Sizers. Capacity depends on fineness of product desired and hardness or toughness of the material being ground. It will grind ordinary granulated sugar at a rate of 75 to 100 lb. per hr. to a fineness of 99 percent through 100 mesh. It can be easily dismantled for cleaning.

Feed rate is controlled by a rheostat, which controls a Syntron vibrator applied in a special manner to the feed hopper and trough. Equipped with a ¾- or 1-hp. motor, the Pulvette can be operated from a 110-v. circuit.—*Pulva Corp.*



MACHINE CONVEYS, WASHES AND DEWATERS

(188E) **This device, called the Pixie, will wash any loose or bulk material and deliver it to stockpile, belt conveyor or chute free of excess moisture. Wash water is introduced through inlets in the bottom, leaves with the contaminants over a three-sided adjustable weir. In some cases wash water can be settled and recirculated. Machine is designed for minimum floor space and headroom.—Eagle Iron Works.**

See

GENERAL AMERICAN

Booths 285-287

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CONKEY Filters and Evaporators

CONKEY Flat Plate Heating Surface Evaporators
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DRIVE UNIT has maximum over-all height of only 24 in. This is made possible by the use of either a.c. or d.c. pancake-type motors.



OVERLAPPING trough sections are rigidly anchored at one end but are free to vary in length with temperature of materials conveyed.

Conveys Hot Materials

Steel troughs built in overlapping sections allow for expansion and contraction.

(190A) A recently developed shaker conveyer is especially designed for handling hot materials, such as silicon carbide, sand, sinter and mill scale. To counteract expansion and contraction of the troughs, they are built in short over-lapping sections. One end of each trough is rigidly anchored to a continuous steel underframe directly beneath each side of the troughing. The opposite end of the trough overlaps the next trough and is free to vary its length in accordance with changes in temperature of the material being conveyed.

Attached to the end of the conveyor is a drive unit, consisting of an electric motor, a gear reducer, and a combination of bar linkages. This unit drives the troughs with a reciprocating motion.

Contrary to popular belief, the maximum speed is practically the same for either forward or reverse direction of trough travel. What moves the load along the conveyor troughs is a constant low rate of acceleration in the forward direction, followed by a high rate of acceleration in the reverse direction. For most materials, this action allows the load to move in the troughing without slipping during acceleration in the forward direction. However, slippage occurs between the load and the trough during the higher rate of acceleration in the reverse direction, and it begins when the force of acceleration on the load overcomes the static force of friction between the trough and the load.

Drive units are built in ratings of 10, 15, and 20 hp., using electric motors, and 15 or 25 hp., using air motors. For applications where a low drive elevation is desired, the drive can be provided with a pancake type motor; such a unit will stand only 24 in. high over-all. Other drives vary in height up to 30 in.

The longest conveyor handled by one of these drive units has a length of 500 ft. Operating speeds, speed characteristics, and stroke lengths can be varied to suit the particular application. Materials can be moved upgrade, downgrade, or on the level. A 90-deg. angle trough can be used to make turns in the line. Where the material is abrasive, the conveyor troughing is made of an abrasion-resisting steel.

Trough widths range from 12 to 36 in.; lengths from 6 to 16 ft.; depths from 6 to 18 in.—*Goodman Mfg. Co.*

Bag Packers With Built-In Accuracy

(190B) Two models of a new bag packer are said to fill to within ounces of a predetermined weight, eliminating the necessity of weighing the filled bags. A built-in scale beam assembly and micro switch arrangement operate a solenoid brake on the feed screw, eliminating spill over and dribble.

Model 1-5 is designed to fill valve bags, open-mouth bags, and drums with a wide variety of granular or powdered materials. Aided by a ribbon agitator in the feed hopper to prevent bridging, the feed screw delivers a positive feed at the rate of 1 cu. ft. in 5 sec. This model is powered with a 5 hp. motor and weighs 950 lb.

Model 1N is specifically designed for bagging insecticides. It requires 2 hp. and weighs 800 lb.—*H. L. Stoker Co.*

Packaging & Handling Briefs

Fork Truck Carriage Assembly—Quickly converts a standard fork truck into a side-shifting truck. Baker-Raulang Co. *(190C)*

Spur-Gear Hoist—Incorporates new design innovations; made in ½- and 1-ton capacities. Coffing Hoist Co. *(190D)*

Motor Driven Trolley—Hydraulic coupling transmitting power from motor to drive unit increases safety, lowers maintenance costs, eliminates trolley brakes and complex electrical speed changing equipment. Yale & Towne Mfg. Co. *(190E)*

Automatic Packer—Handles granular and powdered materials where vibration for a tight pack and elimination of dust accumulation are major factors. For flat bottom containers. Frazier & Son. *(190F)*

Overlapping Drum Ring—Improved locking ring for ICC-17H open-head drums eliminates the gap between the ends of the ring. Drum Parts, Inc. *(190G)*

FOR SAFER CONTROL OF CHEMICAL FLUIDS

USE THESE CRANE HEAVY DUTY ALL-IRON VALVES

Crane Ferrosteel valves—recommended especially for ammonia service—are also ideal for process piping that requires heavy duty valves of all-iron and steel materials. Special Crane seating design and rugged construction combine to make these valves highly effective for safe and economical handling of hazardous or noxious liquids and gases. They minimize the danger of costly fluid losses with important features like these:

TIGHT SEATING—two disc-seat combinations available: (1) special lead-faced disc and integral body seat rings; (2) steel disc and renewable steel seat rings.

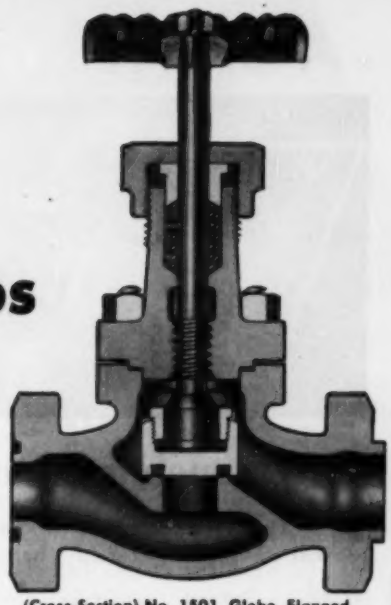
EXTRA-TIGHT STEM SEAL—Unusually deep stuffing box is filled with high grade packing. Machined "back seating" shoulder on stem relieves internal pressure on packing, further assuring a pressure-tight stem seal when valve is wide open.

RUGGED CONSTRUCTION—Heavy, massive metal sections in body help resist distortion; long sweeping interior body contours reduce flow resistance.

LEAKPROOF END CONNECTIONS—Flanged valves have tongue and groove faces for greater tightness and to protect against gasket blowouts. Screwed valves have long threads with a recess for soldering joints.

COMPANION LINES of check valves, fittings and specialties of equally outstanding Crane design are available. Fully described in your Crane No. 49 Catalog. Or see them in Crane Circular 320 on Corrosion-Resistant piping materials—your copy supplied on request by your Crane Representative.



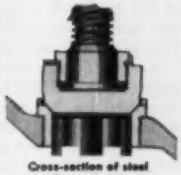


(Cross-Section) No. 1501, Globe, Flanged
Working Pressures: 300 pounds ammonia; 500 pounds oil, gas, or air up to 100° F.
Sizes: ½ to 4-inch.
Tested at 300 pounds Air-under-Water

CHOICE OF TWO TIGHT-SEATING DESIGNS

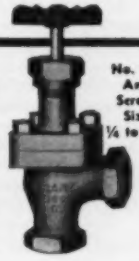


Cross-section of lead-faced disc



Cross-section of steel disc and seat

Crane special lead-faced disc—with facing securely rolled into machined dovetail—seats against crowned face of integral body seat to assure tightness in service. Where temperature or corrosive action does not allow use of lead, these valves can be supplied with a case-hardened steel disc and steel seat ring.



No. 1505, Angle, Screwed Sizes: ¼ to 3-inch



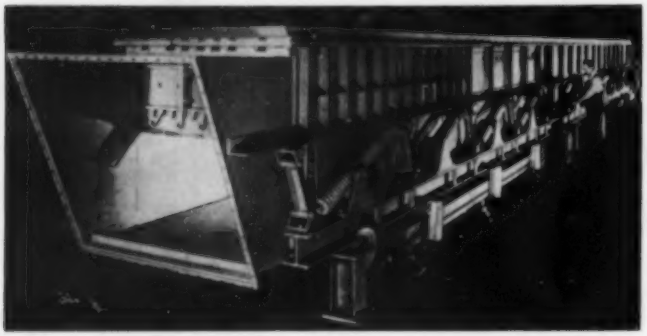
No. 1504, Globe, Screwed Sizes: ¼ to 3-inch

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Air Quenching Cooler Improved

Design changes will reduce maintenance costs, prevent warpage and retain a better seal.

(192A) Reduced preventive maintenance, simplified liner replacement and greater body rigidity are achieved through these recent improvements to the air quenching cooler:

1. The grease-lubricated rod bushings have been eliminated from the travel control spring assembly. Only the drive mechanism need be lubricated.

2. A three-piece liner has been substituted for the two-piece liner used at the feed end. This change simplifies replacement.

3. The body has been reinforced at the feed end to prevent side warpage and to give rigid support to the side plate and end liners.

4. The connection between the cooler body and the housing has been improved by use of a cast iron baffle at the feed end. The heavier casting is not subject to warpage, thereby retaining a better seal between the cooler and the atmosphere.

Since its introduction about 20 years ago, the air quenching cooler has received wide acceptance in the cement industry and has found use also with other materials, such as lime and phosphate. Its function is to air cool hot kiln discharge while recovering the heated air for combustion in the kiln. The maximum practical recovery amounts to about 75 percent of the sensible heat in the kiln discharge. Under optimum conditions this results in a fuel savings of 10 to 12 percent for a wet process cement plant, still greater for a dry process plant.

The cooler consists of a conveying element and a housing. The conveying element comprises a grate which forms the bottom of a carrying trough. This trough is attached to and hangs in a wind box which carries the cooling air. The unit is driven with a reciprocating motion which conveys the material over the grate.

At the feed end the hot kiln discharge falls first onto a 3-in. thick heat-resistant alloy steel grate which extends for the first 5 ft. of length. The next 19 ft. are either 2-in. T-bar or L-bar heat-resistant alloy iron grates. The remaining length consists of L-bar cast iron grate sections. The cooler body is constructed in the shape of a rectangular trough from ⅜-in. plate, adequately reinforced. Cooling air at 4 in. or less static pressure is supplied by a fan.

Standard sizes are 3-ft. width in lengths of 50, 60 and 70 ft., and 4½ ft. width in lengths of 50, 60, 70, 85 and 100 ft.—*Allis-Chalmers Mfg. Co.*

Heat-Transfer Equipment For High Temperatures

(192B) A line of atmospheric pressure, liquid-phase heat-transfer equipment designed to operate at temperatures up to 800 deg. F. has recently been developed. The equipment is offered as individual components adaptable to large industrial requirements, or as packaged units for smaller installations.

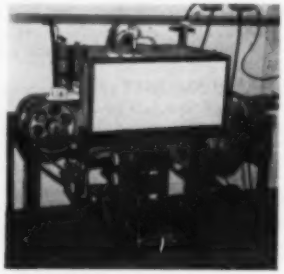
Coal, gas, or oil-fired furnaces with capacities up to 20,000,000 Btu. per hr. are especially designed for high flow velocities to avoid overheating the liquid transfer medium. Packaged units use electric heaters with capacities from 3 to 75 kw. or gas heaters with ratings of 250,000 to 1,000,000 Btu. per hr.; they may also be adapted for oil firing. Prices range from about $1,000 for the 3-kw. size to about $10,000 for the 1,000,000 Btu. per hr. unit.

Three different heat-transfer liquids are used: Hydrotherm 500 is nonflammable, pumpable at room temperature, non-corrosive, and usable up to 600 deg. F. Hydrotherm 700 is pumpable at 20 deg. F., has a very high flash point, and operates up to 650 deg. F. Hydrotherm 800 can be used up to 800 deg. F.—*American Hydrotherm Corp.*



Insulation Band Maintains Snug Fit

(192C) The Expand-R-Strap has recently been developed for holding insulation snugly around piping and equipment. It is a corrugated tempered stainless steel strap, applied like plain strapping with the usual tools. Resistant to corrosion, it can be expected to endure for the life of the insulation. The corrugations permit it to expand and contract, maintaining constant binding pressure.—*A. J. Gerrard & Co.*



CONTINUOUS-BELT FURNACE

(192D) **Electrically heated for any temperature up to 2,000 deg. F., this small continuous-belt furnace is used for firing electronic circuits printed on ceramic or glass plates. Time of travel through the 31-in. long tunnel can be varied from 25 min. to 265 min.—National Bureau of Standards.**

From a beaker to a barrel
to a 5-million-gallon tank . . .

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TOP ENTERING . . . Propeller type. For open and closed tanks. Direct and gear drive.

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- ☐ DH-50 Laboratory Mixers
- ☐ B-100 Condensed Catalog showing complete line
- ☐ B-75 Portable Mixers (Electric and Air Driven)

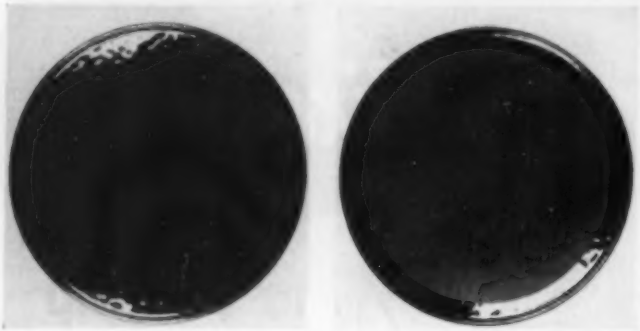
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APPEARANCE of test samples checks quantitative results. New glass (left) is unaffected, standard glass (right) is severely etched, when exposed to buffered NaOH solution, pH 11.5, at 212 deg. F. for 30 days.

New Glass Resists Alkalis

Versatility of glass-lined equipment may be greatly increased by success of this development.

(194A) A new glass, available in the form of glass-lined or glass-coated process equipment, shows a resistance to attack by alkalis much greater than that of ordinary glass coatings. Although not intended for use with high concentrations of strong alkalis at high temperatures nor for any alkaline solution under pressure at temperatures above 212 deg. F., it shows at least a threefold increase in life in the pH range between 10 and 12 and at temperatures under 212 deg. F. This increased alkali resistance has been obtained without any important sacrifice in acid resistance.

The high resistance of glass-lined equipment to most acids except HF is well known to all chemical engineers. Heretofore, however, glass linings have never been suitable for use under alkaline conditions. In many batch processes, especially where neutralization reactions are involved, the pH varies from step to step, making it highly desirable that the process equipment successfully withstand both acid and alkaline exposure.

The new glass should be especially suited for such processes. It should also be helpful in polymerizers for organic plastics, where the polymerization is often carried out at a pH of 10 to 12 and at a temperature below 212 deg. F. One company is said to be planning to use the new glass in equipment for handling hot alkaline hypochlorite solutions, where standard glass-lined reactors have been used in the past, but with rather short life as compared with acid service.

Most of the claims made for the new glass today are based on the results of laboratory exposure tests (see table). Several companies have installed commercial-size equipment on a trial basis. If the service obtained from these units bears out the predictions based on laboratory data, then the new glass would seem to provide a better all-purpose lining than any heretofore available.—*Pfaudler Co.*

Comparative Corrosion Rates of Glass Linings

	Buffered NaOH Solution pH 11.5	0.5% NaOH Solution pH 13	20% HCl Solution
Temperature, deg. F.	212	167	Boiling
Duration of test, days	30	30	30
Corrosion rate, mdd.			
Standard glass	21.0	80.4	1.1
New glass	5.4	21.0	1.5
Corrosion rate, ipy.			
Standard glass	0.012	0.046	0.00064
New glass	0.003	0.012	0.00083
Estimated lining life, yr.*			
Standard glass	3	0.8	58
New glass	12	3	42

* Based on a cover coat 0.036 in. thick.

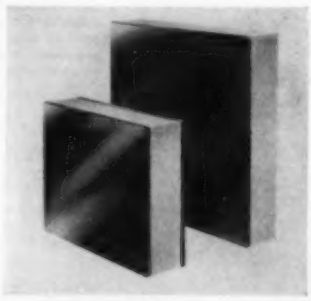
Hard-Facing Rod For Abrasion Resistance

(194B) Wallex is a new oxy-acetylene hard-facing rod with excellent abrasion resistance and good impact and corrosion resistance. It contains chromium, molybdenum, manganese, and silicon, in addition to iron and carbon. Typical applications include conveyor parts, grinder rings, pipeline elbows, plows, chutes, mill plates and crusher teeth.—*Wall Colmonoy Corp.*

Reinforced Plastic Sheet Machines Like Brass

(194C) A new polyester plastic sheet, reinforced with glass fiber, is said to have punching and machining qualities similar to brass. Here are some of its other properties: Tensile strength, 11,900 psi.; compressive strength, 14,300 psi.; water absorption, 0.39 percent; dielectric strength, 325 v. per mil; arc resistance, 120 sec.; power factor, 4.24; dielectric constant, 4.83; specific gravity, 1.38.

Available in thicknesses of $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ in., the new plastic sheet is chemically resistant to acids, salts, mild alkalis, and many solvents.—*Dynakon Corp.*

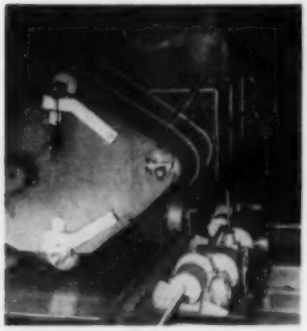


Fluorocarbon Sheets With Metal Surfaces

(194D) A new series of metal-surfaced dielectric materials is based on Teflon, Kel-F, and mixtures of these with various other materials, such as asbestos, mica, glass, or calcium silicate. The metal surfaces available on any of these materials include aluminum, copper, tin, zinc, steel, and many other alloys and precious metals.

Sheets may be metallized on one or both sides. Standard thicknesses of dielectric material range from 0.03 to 1.5 in., and of the metal from 0.004 to 0.25 in. The bonding of

the metal to the fluorocarbon is done by an exclusive method. — *United States Gasket Co.*



Polished Finishes For Clad Steel Equipment

(195A) In addition to the smooth sodium hydride finish regularly supplied, you can now get polished finishes on your stainless-clad, nickel-clad, Monel-clad, and Inconel-clad equipment. A recent installation of modern polishing machinery makes these finishes now available.

Sodium hydride finish is suitable for most heavy processing equipment. It finds wide application in stills, digesters, and other process vessels. It has been used successfully in brewery equipment; some brewers, in fact, prefer it over highly polished finishes.

For many applications, however, polished finishes are desirable. The new installation can provide any of three different finishes of varying smoothness and luster. They are available on flat plates only. All are furnished with a protective coating, which may be sprayed plastic, masking paper, or heavy kraft paper and wallpaper paste.

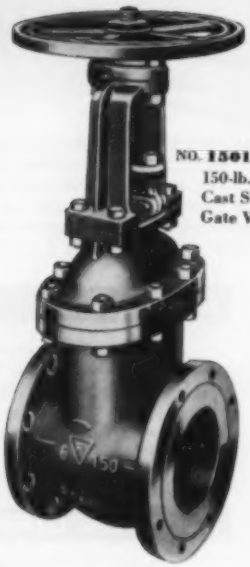
Although these clad steel finishes have better forming adaptability than polished finishes on the solid alloys, because of the steel backing, such finishes are not recommended where hot spinning, pressing, or other extensive forming or fabricating operations are to be performed; the finish is apt to be impaired or destroyed in the process. For the most part, therefore, these finishes should be specified where only mild forming is required. —*Lukens Steel Co.*

Aluminum Welding Rods For Torch Welding

(195B) For applications where a dark weld deposit from anodized silicon-bearing rods is objectionable, a new flux-coated aluminum rod for oxy-acetylene and oxy-hydrogen welding provides a weld which closely matches



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the base metal in color, corrosion resistance, and physical properties. The flux coating is low melting, making for minimum heat application. The new rod, known as EutecRod 22FC, is made in ⅛-in. and ¼-in. diameters.—*Eutectic Welding Alloys Corp.*



Polyethylene Valves For Process Piping

(196A) Agilene valves are made in 1-in. and 2-in. sizes with standard drilled flanges for easy incorporation into new or existing piping systems. They are fabricated completely of polyethylene, except for the packing rings, which are made from a polyethylene-polyisobutylene mixture.

These valves are resistant to most corrosive chemicals, including hydrofluoric, sulphuric, nitric and hydrochloric acids at temperatures up to 170 deg. F.

In addition to being more corrosion-resistant than most metals and alloys, the new valves are also extremely light in weight. The 1-in. valve weighs only 1 lb. and the 2-in. valve weighs 3¼ lb.—*American Agile Corp.*



POLYETHYLENE BOTTLES

(196B) Blow-molded, one-piece bottles of 1-gal. and 2-gal. capacity are now being made of polyethylene. Details of the blow-molding process are still under wraps.—Plax Corp.



Metallizing Guns Spray at High Speeds

(197A) Two new metallizing guns recently announced are said to develop the highest spraying speeds yet available in guns designed for hand-held operation. They incorporate a patented jet siphon principle in the gas head which automatically compensates for variations in gas pressure as high as 10 psi. and provides a steady flame for producing uniform coatings.

The Metco Type 4E gun (shown above) sprays wires from 20 gage to ¼ in. in any metal at speeds up to 40 percent faster than previous models. Type 5E is said to be the first gun specifically designed for high-speed spraying of the softer metals, such as zinc and aluminum. It works with 3/16-in. wire and will deposit as much as 55 lb. of zinc per hr.—*Metallizing Engineering Co.*

Turbo-Generators With Inside Gas Cooling

(197B) A new method of cooling large turbine generators will make it possible to increase ratings by as much as 50 percent, according to a report. The new cooling technique consists simply of blowing hydrogen gas at high velocity through specially constructed hollow generator coils. This brings the hydrogen in direct contact with the copper in which the heat is generated. For a given maximum temperature rise, the hydrogen cooling makes it possible to pass more current through the coils, since the additional heat that results can be quickly dissipated.

Internal cooling is particulary applicable for ratings of 90,000 kw. and above. The improved cooling makes possible the construction of ratings much larger than now possible with conventional hydrogen cooling. Under present conditions the reduction in physical size of generating units for a given rating is important, since it saves copper and steel. Costwise, however, the more expensive hollow coil construction offsets the savings in material.—*Westinghouse Electric Corp.*

Compressed Air Filter Doubles as Condenser

(197C) A new compressed air line filter functions also as a condenser, owing to its extra size and cooling surface. It has a steel outer shell 6 in. dia. by 36 in. long and a steel inner cartridge 5 in. dia. by 24 in. long, loosely packed with Fiberglas.

Air enters the inlet opening and passes down between the inner and outer shells. Expansion of the air and the extensive cooling surface cause moisture in the air to condense and fall to the bottom of the outer shell, where it is discharged through a drain valve. The air then passes through the Fiberglas in the inner cartridge, which baffles out any remaining moisture.—*Air-Line Engineering Co.*

Nylon-Lined Bearings Are Dimensionally Stable

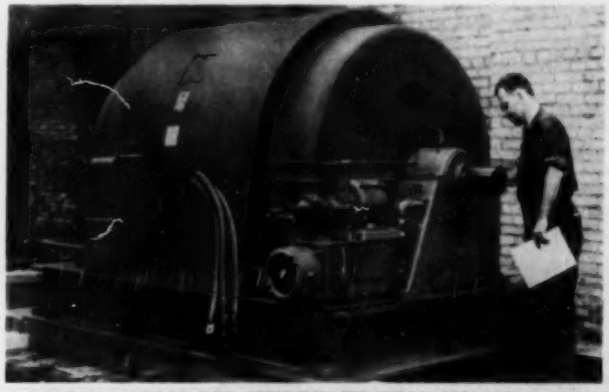
(197D) Nylon-lined bearings, a recent development, offer a number of advantages over solid nylon bearings. They eliminate the need for the wide clearances which are necessary in plain nylon bearings to compensate for dimensional changes due to thermal expansion and moisture absorption. They can be inexpensively and rapidly installed by press fit or clamping methods—there is no cold flow or creep problem. There is no danger of seizure due to stress deformation.

A typical Nylined bearing consists of an outer sleeve of an inexpensive metal with a relatively thin lining of Du Pont FM 10001 nylon bearing material. The liner is retained in the sleeve in a manner which permits it to expand and contract circumferentially around the inner periphery of the sleeve. It is provided with a narrow slot, or compensation gap.

Nylon has proved to be an excellent bearing material. It performs well under adverse lubricating conditions or even with no lubricant at all. The tough glazed surface which develops on nylon results in extremely low friction coefficients, with a comparable low rate of wear.—*Thomson Industries, Inc.*

Steam Cleaning Unit Has Three Guns

(197E) The Power Master steam cleaning unit, designed especially for heavy duty, has two high-pressure steam guns, each delivering 150 gal. per hr. It also incorporates a high-pressure water gun supplying hot or cold water at 500 psi. at a rate of 1,000 gal. per hr. The water gun has been found useful for blasting away accumulations of mud, muck



ELECTRIC MOTORS FOR PIPELINE PUMPING SERVICE

(197F) **Eight 3,000-hp. electric motors, the largest ever built for pipeline pumping service, are being installed by Texas Pipe Line Co. Operating at 1,780 rpm., they will be used to drive centrifugal pumps. Despite their great horsepower, the motors will be started across-the-line at full voltage.—Electric Machinery Mfg. Co.**

Pangborn DUST CONTROL

Turns Dust Into Profits!



At Flury Foundry, this small and inexpensive Pangborn Dust Collector stops dust caused by blast cleaning operations . . . pays its own way in increased efficiency.

At Dodge Cork Company, a Pangborn Dust Control System salvages $5000.00 worth of cork dust every year from some 40 sawing and polishing machines.

At Landers, Frary & Clark, a Pangborn Dust Collector like this traps 522 cu. ft. of cast iron dust per day . . . company records prove maintenance costs are lower than ever before.

Dust is no problem for plants with Pangborn Dust Control. As these three cases (picked from hundreds in our files) show, a Pangborn Dust Control System *saves money* on maintenance when dust is a nuisance, saves money when dust has salvage value.

FIND OUT TODAY

how you can *save money* with Pangborn Dust Control. Write for your copy of Bulletin 909-A to: PANGBORN CORPORATION, 2600 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment.

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits

and heavy grease, and is efficient in de-icing operations.—*Kelite Products, Inc.*



Labeling Tape Is Water and Smudge-Proof

(198A) A new pressure-sensitive labeling tape works like your child's magic slate. Made of two layers of acetate with a white waxy substance sandwiched in between, Labelon tape is claimed to be water-proof, oil-proof, smudge-proof, and acid-resistant. When you write on it with a pencil, stylus, nail or other blunt instrument, the pressure on the top clear layer indents the thin white layer and exposes the colored bottom layer to view. You can type labels merely by flicking the ribbon lever to "stencil."

The pressure-sensitive adhesive which requires no moistening, will ad-



VACUUMS AS IT SWEEPS

(198B) You'll have to maintain a waiting list of applicants for the janitor's job if you purchase one of these power sweepers. Driven by an 8-hp., 4-cycle, air-cooled engine, this machine has a vacuum action which keeps the air free of swept-up dust.—Wilshire Power Sweeper Co.

here to almost any clean surface. In addition, the tape can be transferred from one surface to another without leaving a sticky residue.

Labelon is available in black, blue, red, or green color in six widths from 8 mm. to 1½ in. Standard 400-in. long rolls up to 1-in. wide are packaged in self-dispensers with built-in cutting edges. Industrial (800-in. long) rolls are mounted on 3-in. cores to fit any of the heavy-duty tape dispensers. List prices range from $1.25 to $7 per roll, depending upon length and width.—*Labelon Tape Co.*



Selenium Rectifiers In Larger Sizes

(199A) Higher capacity selenium rectifiers with fewer parallel elements are now possible, using extra large cells made by a new vacuum process. These rectifier units convert a.c. to d.c. for such applications as battery chargers, arc lamps, vibrating feeders, electrical precipitators and d.c. motors.

Rectifier cells are available in 16 standard sizes, from 1 by 1 in. up to 12¾ by 16 in. The smallest and largest sizes are shown in the illustration, the smallest being barely discernible in the man's hand. Compact units of 50 kw. and larger can be assembled from the larger size cells. —*Syntron Co.*

Electrical & Mechanical Briefs

Visual Aid System—Magnetic devices used with magnetic steel board. For production and inventory control and scheduling. Magnetic Merchandising, Inc. *(199B)*

Vapor Purifier—Uses the motion of the vapor as a means of separating moisture and entrainment, has two stages. Centrifix Corp. *(199C)*

Waterproof Cloth Labels—Waterproofed cotton fabric backed with waterproofed pressure-sensitive adhesive. Can be printed in one or two colors. Topflight Tape Co. *(199D)*

Here's how Pangborn

Solves these Problems

with this modern equipment

BLAST CLEANING!





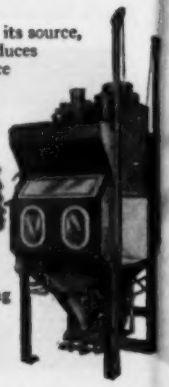
Blast Cleaning Cabinet quickly and easily cleans rust, grime, dirt, paint, etc., from metal parts. Produces a clean, smooth surface on pieces up to 60" x 36". Models available from $315.00 and up.

Blast Cleaning Machine not only removes rust, dirt, scale, etc., but is ideal for maintenance and many other uses. Cleans large objects such as bridges, structural work, tanks before painting. Six sizes, portable or stationary, from $170.00 and up.



DUST COLLECTING!

Unit Dust Collector stops dust at its source, minimizes machine wear and tear, reduces housekeeping and general maintenance costs. Solves many grinding and polishing nuisances. Reduces material losses. Models from $286.00 and up.



PRECISION FINISHING!

Hydro-Finish Cabinet uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001". Models from $1295.00 and up.

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☐ Blast Cleaning Cabinets
☐ Blast Cleaning Machines
☐ Unit Dust Collectors
☐ Hydro-Finish Cabinets

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Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....

Company.....

Address.....

City.....Zone.....State.....



Temperature Regulator
Direct or Reverse Acting

(200A) Ruggedness and dependability are key features claimed for this new temperature regulator. Its sensitive element is an Invar rod enclosed by a copper bulb. The standard dial is calibrated for 50 to 250 deg. F., but it is available also for 150 to 350 deg. F.

Regulation is done by compressed air or water at 15-20 psi. You can change from direct to reverse-acting in a matter of minutes, it is claimed. To change the control point, you merely turn the adjustment knob.—*Powers Regulator Co.*

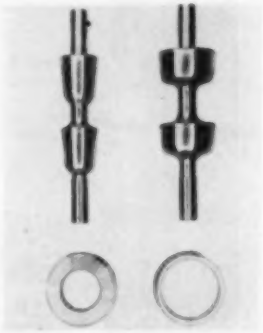


Level Switch
Ignores Surface Foam

(200B) The new Tektor level switch can be used for level control of practically any liquid or solid, regardless of viscosity, conductivity, surface foam or turbulence. The instrument operates on the basis of detecting the capacitance change caused by physical movement of the medium. There is no need to make contact with the medium. The probe or electrode may be a steel or glass-covered finger, or it may be a plate in the side of the vessel. It actuates a relay via a simple electronic circuit.

Model AJ-1, the simplest unit, will handle most applications. The electrode normally consists of a probe mounted in a threaded bushing and extending 4 to 6 in. into the container. Signal lamps on the instrument indicate whether the level is above or below the control point.

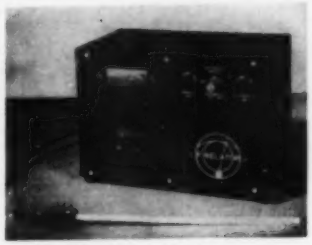
For applications where discrimination against turbulence and froth on the surface of the liquid or where control of the interface between two immiscible liquids is required, more sensitive models are used. Differential limits as low as 1/32 in. in the case of liquids can be obtained.—*Fielden Instrument Corp.*



Control Valves
With Reduced Trim

(200C) Point 4 has taken on a new meaning in addition to the extension of technical assistance to backward nations. A new design of reduced capacity trim for control valves is called the Point 4 Factor trim. Origin of this term lies in the 0.4 multiplying factor which expresses the ratio of reduced valve capacity with the new trim to full capacity with standard trim. The reduced trim is available for both solid-turned and V-port types in sizes 1½ to 8 in.

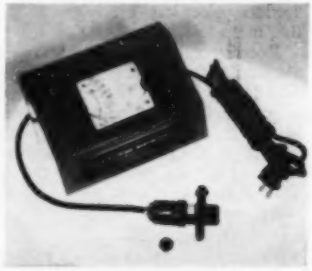
Design of the new trim is based on reduced diameter seat rings and plugs with standard valve strokes. This method of obtaining reduced capacity is said to be superior to either (a) standard seat rings in combination with plugs with substantially reduced port areas, or (b) standard seat rings and plugs with reduced valve strokes. Neither of the two latter methods improves the ability of the valve to handle low flow rates. In the actual design of the new trim, the 0.4 factor was selected on the basis of obtaining an appreciable capacity reduction within practical construction limits.—*Mason-Neilan Regulator Co.*



Temperature Controller
With Limit Switch

(200D) The recently developed Firelator automatic temperature controller combines temperature limit control with temperature maintenance control. On limit control, it provides a positive shut-off and can only be re-started manually. Control is achieved by the use of a thermocouple, a pyromillivolt-meter, and an adjustable photocell bridge.

The instrument is made in three standard ranges up to 2,250 deg. F. and one special range to 3,000 deg. F. It may be used to control any electric furnace. Designed to operate as a plug-in unit, it is not affected by voltage surges and will operate from 70 v. to 140 v. a.c. without requiring any adjustment.—*Lawrence Instrument Co.*



Electronic Manometer
Actuated by Thermopile

(200E) A new, highly sensitive electronic manometer, actuated by a noble metal thermopile, will measure pressure differences as low as 0.001 in. water. Operation is very simple. All you do is connect the two taps on the gage tube to the two points across which the pressure difference is to be measured. You can use the instrument as a flowmeter by placing the tube directly in the line for low flow rates or connecting it to the pressure taps on two sides of a calibrated orifice for high flow rates.

Calibration and accuracy are not affected when long extension cables are used from the gage tube to the meter. This permits remote installation.

Accessories available include a five-position switching attachment. This permits monitoring of gage tubes in five different locations with one indicating meter.—*Hastings Instrument Co.*

Automatic Control System With No Transmission Lags

(201A) The Autronic instrumentation and control system is said to be the first centralized, miniature, all-electronic system for measuring and controlling process variables such as temperature, pressure, level and flow. It consists essentially of three basic units: primary sensing element, Autronic control unit, and final control element. Since transmission of information throughout the system, from primary element to final element, is by electrical means only, there are no transmission lags.

The primary element generates a voltage which is directly proportional to any change in the process variable. This voltage, always within the same range regardless of whether temperature, pressure, flow or level is being measured, is transmitted to the Autronic control, where it is continuously modulated by electronic means. The Autronic control unit then transmits the resulting direct current to the final control element, which may be either electrically or pneumatically operated.

If a record of the variable is desired, an Autronic recorder can be plugged into the circuit. This unit is designed with an independent chart drive and has spools arranged to permit inspection of past records without interruption of the pen track.

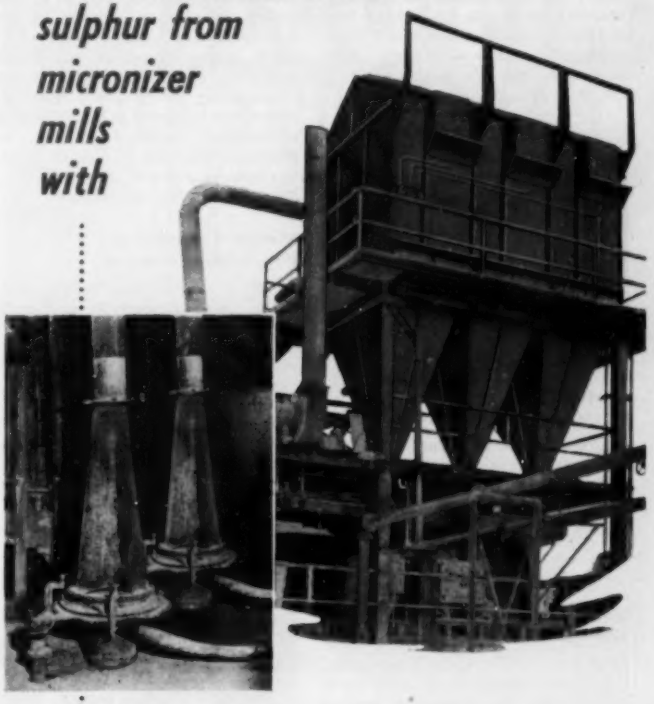
The system can also include the Autronic manual controller, which permits switching from automatic to manual control, or vice versa.—*Swartwout Co.*

Purge Meter Made of Acrylic Plastic

(201B) A recently developed purge meter is made of acrylic plastic, eliminating packing glands and glass parts. The metering tube and all piping connections are bored from a block of plastic.

The meter comes in two standard models and four sizes, with a range of 0.01 to 54 gal. per hr. of water and 0.2 to 216 cu. ft. per hr. of air. The rate of flow is visibly indicated by the position of a spherical float in the metering tube. Model R 2000 has

. . . . DUSTUBE collects sulphur from micronizer mills with



Superior Overall Perfomance

Collecting sulphur after it has been reduced to particle size of less than four microns requires a dust collector that can stand up under repeated inherent processing explosions. For this application at the Micronized Products Department of Corona Chemical Division, Pittsburgh Plate Glass Company, a Dustube Collector, with special explosion relief features designed to Pittsburgh specifications, was selected because of superior overall performance. It withstands the explosions without damage to the system and then resumes operation quickly.

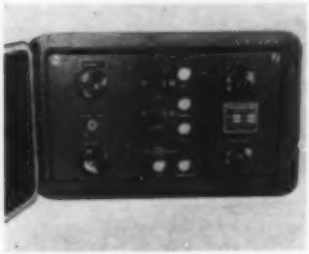
Serving both as a materials handling and recovery unit, the Dustube collects Corona Micronized Wettable Sulphur and Dusting Sulphur from micronizer mills and feeds it by gravity to the packing department. None of the valuable fungicide material is lost.

The Dustube has an unusual flexibility in handling dust, fume and material in all types of chemical processes. Be sure to include it for comparison in any investigation you make of dust and fume collecting equipment. Send also for new Catalog No. 72-B.

American WHEELABRATOR & EQUIPMENT CORP. dustube® COLLECTORS

347 S. Byrkit St., Mishawaka, Ind.

etched reference marks for approximate flow indication, while direct flow readings are made with Model S 2000, calibrated for either air or water. Both models are safe for pressures up to 100 psi.—*Brooks Rotameter Co.*



Control Unit
Allows for Process Lags

(202A) A new automatic control unit is especially designed for uses where there is a considerable time lag between the making of a correction and stabilization of the process variable as a result of the corection. The control may be set up to ignore momentary deviations, then make corrections which are proportional to the deviation from the desired control-point at time intervals automatically adjusted to suit the process. This type of control is said to eliminate over-correction and hunting.—*Fielden Instrument Corp.*

Weight Transmitter
For Remote Control

(202B) The new weight transmitter is a completely pneumatic scale for either batch weighing or continuous process control. It converts a variable force into an easily measured pneumatic signal. Operating on the force-balance principle, the transmitter will indicate, record or control weight or force through standard instruments in the manner commonly applied to temperature, pressure and flow problems.

In operation the scale balances out any tare, thus allowing net weight to be indicated directly on standard panelboard instruments. Accuracy of the output signal is said to be limited only by the characteristics of the indicating instruments used with it.

A unit capable of weighing up to 10,000 lb. occupies less than 1 cu ft. of space. Sizes are availabe to weigh directly up to 40 tons. Requiring no electricity, the weight transmitter is well suited for use in hazardous locations.—*Fluid Controls Co.*

Instrumentation Briefs

Mercury Trap—Designed to trap mercury blown from manometers. Uses porous stainless steel membrane. Chemiquip Co. *(202C)*

Cupcase Thermometer—Fits into 2-in. pipe, for dipping samples at various storage tank levels. Weston Electrical Instrument Corp. *(202D)*

NEW FLUIDS HANDLING EQUIPMENT

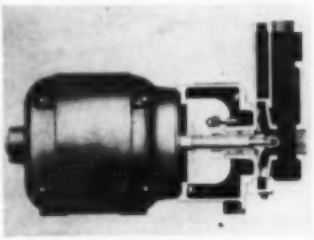
Roof Ventilators
With Airfoil Propellers

(202E) The recently redesigned Iron Lung, a power roof ventilator, is built in four easy-to-assemble sections —base, chassis, head, and fan assembly. The chassis, a new and unique feature in ventilator design, is an all-welded steel section that firmly connects the head and base. It protects the fan assembly, strengthens the entire unit and dampens vibrations.

These units are built for erection on any type of roof. Both fan and damper are shaped with an airfoil section. Dampers are opened by the force of the air stream. They are hinged at the outside edge to swing upward and outward. This method of hinging provides a maximum opening without any large obstruction in the path of the air stream. The fan can thus discharge fumes and dust to a height of 30 ft. above the roof.—*Iron Lung Ventilator Co.*

Swivel Joint
With Lapped Metal Seal

(202F) A new packless swivel joint uses a ball-and-socket-type all-metal seal. The lapped surfaces of the seal are held under constant pressure at all times by a series of studs and springs. These joints can be made in a variety of materials.—*Phillips Rotary Joint & Valve Co.*



Self-Priming Pump
Eliminates Air From Suction

(202G) A new line of self-priming Motorpumps is intended for applications under suction lift where the presence of air or vapor makes it impractical to use conventional centrifugal pumps. The new pumps eliminate appreciable volumes of air or vapor by recirculating liquid trapped in the casing.

The pump impeller discharges through two passages into a discharge chamber. During priming the upper passage discharges a mixture of vapor and liquid into the chamber where the vapor separates from the liquid and passes out the discharge pipe. The remaining liquid re-enters the impeller through the lower passage to mix with more vapor drawn in from the suction pipe.

When the suction pipe is finally filled with liquid and the pump is primed, flow through the lower passage reverses and both passages act as normal pump discharges. During normal operation there are no recirculation losses and thus no need of valves to cut off recirculation. No flap valve is used because the pump casing is so proportioned that sufficient liquid is trapped on shutdown to insure priming when the pump is restarted.

The pump is built in sizes from ¼ to 25 hp., with capacities up to 800 gpm. and heads up to 180 ft.—*Ingersoll-Rand Co.*



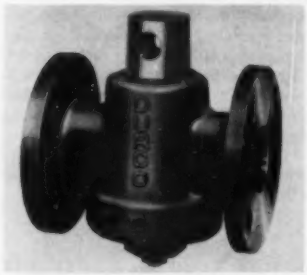
Relief Valve
Controls at Low Pressures

(202H) A new relief valve features accurate control on 2 psi. air pressure and large volume exhaust at 3 psi. Originally developed for use on inflatable rubber boats, this valve has been designed for applications too exacting for conventional relief valves.

Working parts are mounted in a flexible rubber base and are protected by a steel cap and rubber shield. Components are made of stainless steel and natural rubber or neoprene.

The new valve can be attached to

either flexible or rigid surfaces. Attachment to flexible surfaces is accomplished by cementing valve base to the unit it will control. For mechanical mounting the valve is provided with bolt holes in the base to customers' specifications.—*Andrews-Alderfer Processing Co.*



Teflon-Lined Plug Valve Omits Packing and Lubricant

(203A) Type F plug valve has been developed recently for heavy-duty service under severe corrosive conditions. It employs a Teflon liner in combination with a Durimet 20 body. Other corrosion-resistant alloys, such as Monel, nickel, aluminum, and stainless steels, can be furnished if preferred to Durimet 20.

The new valve has no packing, lubricant, or metal-to-metal contact. A slight taper in the plug provides pressure between plug and liner which would normally destroy the film contact of any available lubricant and lock any metal-to-metal contact. In the Type F, the Teflon liner permits the valve to be easily turned, and the high pressure prevents any substance from getting between the liner and the plug or body .

Sizes available are ¾-in. through 1-in., with either threaded or flanged ends. Pressure rating is 150 psi.—*Duriron Co.*

Process Pump Is Designed for Versatility

(203B) A new process pump has a liquid end which is completely self-contained, making it easy to provide the optimum material of construction for any chemical service. It can be had in iron, bronze, stainless steel, Monel, nickel or other special alloys. The mounting pedestal is of cast iron.

The shaft is made of either high-grade carbon steel or stainless steel, depending upon the service requirements. Most pumps are furnished with shaft sleeves of cast bronze or other special material extending through the stuffing box to protect the shaft from scoring, corrosion or other damage. A number of sealing

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- *fused metal shoulder*

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*Proved in independent comparison tests by Norris and Spofford, *Transactions of the ASME, July 1942*

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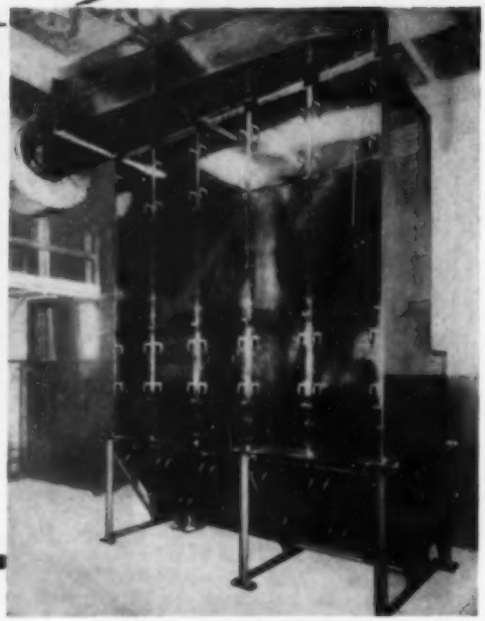
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in Processing of
FERTILIZERS
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U. S. Design and Manufacture by
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Dust problems are effectively solved with the Simon Suction Filter Dust Collector. This self-contained, all-metal unit needs no accessory equipment except a fan and connecting ducts. Dust is collected at practically 100% efficiency, permitting air to be blown out of the chemical plant without costly loss of materials, or into the building without risk of dusty atmosphere. Cleaned air from collector can be returned to plants to save heat in winter, and blown outside in summer to control humidity • Streamlined ALL METAL design with minimum ledges and dead spots • Minimum maintenance cost • Low power — 1-HP to operate 12-section unit • Operates under suction, eliminating dust leaks. Send for complete information. ENTOLETER DIVISION, The Safety Car Heating and Lighting Co., Inc., 1197 Dixwell Ave., New Haven 4, Connecticut.

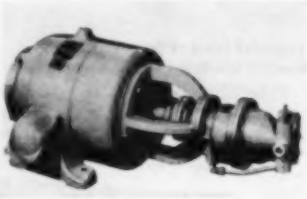
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arrangements are available. Stuffing box may be water cooled for services up to 500 deg. F.

Bearings are of the double-row, oil-lubricated type; oil is carried to the bearings by two oil rings running in an oil reservoir. The use of oil as a lubricant eliminates one of the most common causes of bearing failures—over-greasing. Oil lubrication also makes it possible to cool the lubricant, thus allowing operation at higher temperatures. A sight gage is attached to the pedestal so that oil level can be seen and maintained properly.

Capacities range up to 1,200 gpm., with heads up to 250 ft.—*Allis-Chalmers Mfg. Co.*



High-Pressure Pumps Use Rolling Pistons

(204A) Just recently announced are three new constant delivery pumps for pressures up to 5,000 psi. Each unit consists of an axial rolling piston pump, a supercharging gear pump, a gear pump relief valve, and an adjustable reverse-flow, high-pressure relief valve. These pumps are normally used for supplying high-pressure oil to hydraulic devices.—*Oilgear Co.*



Hose Couplings Make Quick Connections

(204B) The new Kamlok coupling assemblies enable you to make tight connections between tank truck hose and faucet in just a few seconds in all kinds of weather. All you do is

slip coupler over the adapter and press the cam levers. They release instantly when desired. Sizes 1 in. to 3 in. are made of special hard bronze for long wear. The 4-in. size is made of a high-strength aluminum alloy.—*OPW Corp.*



Glass Pump For Corrosive Liquids

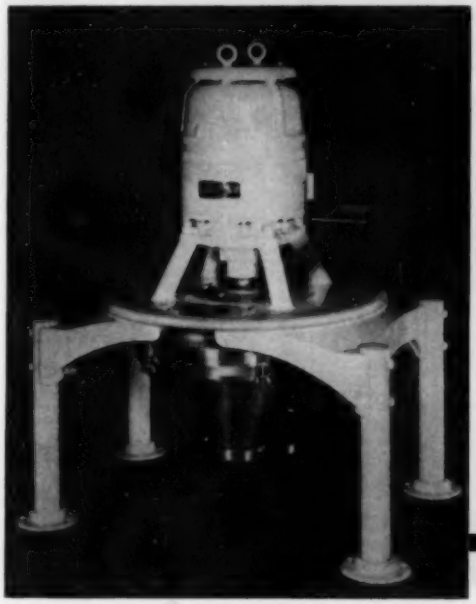
(205A) A recently introduced glass pump will handle any process liquid of pH 8 or less, except concentrated hydrofluoric acid and glacial phosphoric acid. In addition to the first model, rated at 300 gal. per hr., the manufacturer will soon have in production a larger size rated at 800 to 1,000 gal. per hr.

The operation of this pump was described in our feature report on "Glass," published in April. It works like an automatic blow case. Two parallel chambers equipped with check valves and automatic solenoid-operated air valves alternately fill and empty as air pressure is applied and released. The admission of air is regulated by a timer.

This pump will not draw a suction lift, requiring a suction head of 4 ft. for maximum pumping capacity. In other respects it is more versatile than glass centrifugal pumps. There are no bearings, glands, or packing. It can handle liquids containing moderate amounts of solids; running dry is not seriously damaging. It can stand temperatures to 200 deg. C.; this means that it can be cleaned with steam.

The new glass pumps have been preceded by a number of years' successful operation of metallic pumps designed on the same basic principles. These pumps have been especially useful for feeding filter presses. They build up pressure automatically. The final pressure can be set as desired when the pump is working against an empty press; it can be left unattended until the final pressure is reached, when the press will be full and the cake solid.—*Tungstone Products Ltd.*

Cut Processing Cost—Improve Products with this New MIXER



Now in Use for
Soaps
Fertilizers
Insecticides
Plastic Powders
Flour Mixes
Dyes & Enamels
Detergents
and various free-flowing substances used in the chemical processing industries

The "ENTOLETER" Mixer requires only 12 cu. ft., with capacity of 12,000 lbs. of finished mix per hour. This equipment destroys all stages of insect life where beetle or similar insect infestation may be present.

The "ENTOLETER" Mixer is a new-type centrifugal machine designed to provide thorough mixing and blending . . . in faster time . . . at reduced cost. In actual manufacturing operations in the chemical process industries, this equipment is producing amazingly uniform mixtures, simply and economically.

CONTINUOUS MIXING: The "ENTOLETER" Mixer produces a finished mixture at rates up to 250 pounds per minute. Where ingredient percentages in a formula are sufficiently large to allow accurate metering, a truly continuous operation is achieved.

ADAPTABLE TO BATCH SYSTEM: The "ENTOLETER" Mixer is easily incorporated in the processing system as a final mixer. It serves to shorten mixing time, with consequent savings and appreciable improvement in product quality. Send for complete information. ENTOLETER DIVISION, The Safety Car Heating and Lighting Co., Inc., 1197 Dixwell Ave., New Haven 4, Connecticut.

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Preparing an oil fraction that lets labor-short cotton growers use . . .



BEFORE, cotton weeds were hand pulled.



NOW, new herbicide does thorough job.

Herbicide Instead of Hoe

(206A) A new oil, properly applied, kills weeds right in the cotton rows without harming the cotton. Lion Oil Co. developed the new petrochemical, known as Herbicidal Oil #1, to eliminate expensive hand-hoeing operations.

The control of weeds and grasses in cotton fields is one phase of cotton culture which has stubbornly resisted mechanization. Under modern methods, machines have taken over most of the work in the fields but the field-hand with his hoe has continued to keep grass out of the rows. The decreasing supply of manual labor available to the cotton grower has made the planting of large acreages risky. Increasing cost of labor has reduced greatly the profits.

Lion Oil's solution to the problem was introduced to the grower during the 1950 season on a limited basis. The company's petrochemical researchers had finally singled out the right oil fraction for the job. An extensive testing period had preceded registration of the product with the Dept. of Agriculture as a herbicide. This year its distribution has been much wider. However, it is still limited to those growers whose initial use of the material can be supervised by the company's field representatives.

As a first step in Lion's assistance program the interested farmers in each specific area were called together in a conference with the company's technical representatives to hear a full explanation of the material and its proper usage. Schedule of the field service representatives was set to conform with the time of initial and subsequent applications in each field included in the program.

The oil is usually applied three to five times during the season and the recommended dosage is approximately 5 gal. per acre per application. Seasonal cost for the Herbicidal oil thus varies from $3.75 to $6.25 per acre.

One properly equipped four-row tractor can handle the weed and grass problem throughout the growing season on approximately 150 acres of cotton. Applications can be, and usually are, made at the same time and by the same tractor that is cultivating the middles and shoulders of the cotton rows. Thus the labor cost of application is held to a minimum.

Methylbenzyl Amines

Three intermediates look promising for preparation of amine salts and amides, emulsifying agents, detergents. (206B)

Carbide and Carbon Chemicals is producing commercial quantities of α-methylbenzyl amine, α-methylbenzyl monoethanolamine, and α-methylbenzyl diethanolamine. Introductory 55-gal. drum price for each is $1.25 per lb., fob. South Charleston, W. Va.

These products are aryl-substituted alkyl amines and their behavior in many respects is similar to the lower alkyl amines. The phenyl group gives increased oil solubility which suggests applications as intermediates in the preparation of surface-active agents with different characteristics from

those made from simple alkyl or ethanol amines. All of these intermediates provide means of introducing the α-methylbenzyl group into more complex molecules, such as those useful for textile treatment or pharmaceuticals.

Liquids with mild ammoniacal odors, all three amines are soluble in organic solvents. An unusual characteristic is their behavior with water. They are only slightly soluble in water, but water is soluble in them to a great degree.

For preparation of amine salts and amides, emulsifying agents, dyestuff gas-fading inhibitors and other textile specialties, α-methylbenzylamine is the ticket. It is also suggested for the absorption of carbon dioxide in non-aqueous scrubber fluids such as toluene lube oil or heptane. Because these oils are poor solvents for the amine-carbon dioxide salts, the salts can be readily separated. Regeneration of the amine from the salt can be accomplished by heating at temperatures below 125 deg. C.

When a thin film of α-methylbenzylamine is exposed to the atmosphere, a white solid composed of the carbonate and carbamate of the amine is rapidly formed. This solid reaction product with carbon dioxide is only slightly soluble in the parent amine but is readily soluble in water.

A secondary amine, α-methylbenzyl monoethanolamine's hydroxyl group can be esterified. Like simpler ethanolamines, it offers many possibilities as an emulsifying agent or in reactions to prepare amine salts, and amides.

In addition to its use in the preparation of emulsifying agents and the common reactions to form amine salts and esters, α-methylbenzyl diethanolamine forms quaternary bases by reaction with alkyl halides. Such bases may be of interest in new detergents and germicides.

Emulsion Cleaner

Odorless; easy on the hands. (207A)

FO-106, recently developed by Fine Organics, Inc., is an odorless solvent emulsion cleaner which will not burn the hands. These properties are traceable to the fact that the compound contains neither cresyllic acid or free caustics.

It may be applied to clean greasy, dirty surfaces and parts by pressure, spray or brush. Or it can be used in parts cleaning tanks at room temperature for cleaning by soak method. Before use it should be diluted with kerosene, varsol or similar solvent from four to nine parts. For light service cleaning or painted surfaces, FO-106 may be diluted with water up to 20 parts. It is rinsable in either hot or cold water both before and after dilution. It meets specification C-147-1 (Navy).

FO-106 is available in 5-gal. drums at $1.80 per gal. and 53-gal. drums at $1.54.

Promoted Detergent

Detergent and detergent promoter incorporated in one homogeneous product ease handling storage problems. (207B)

First and only promoted industrial detergent to be commercially produced has been announced by Wyandotte Chemicals Corp., Wyandotte, Mich. In properly compounded cleaners, this field-tested product can be substituted for any other alkyl aryl sulphonate detergent. It is said to improve by 20 to 70 percent soil removal and whiteness retention properties in the cleaning and processing of cottons.

Known as Kreelon CD, the product is an integral mixture of Wyandotte's Kreelon, an alkyl aryl sulphonate type detergent, and Carbose, sodium carboxymethylcellulose. It will find special application in the laundry and textile fields for such operations as commercial cleaning, scouring, kier boiling, after-soaping. It is said to reduce skin irritation and to produce long-lasting suds.

Until now, this combination of advantages was only available to those with storage space and handling facilities for both a detergent and a detergent promoter. Wyandotte is offering both in one fast-dissolving, dustless product.

IN BRIEF—A capsulated listing of this month's newsworthy products

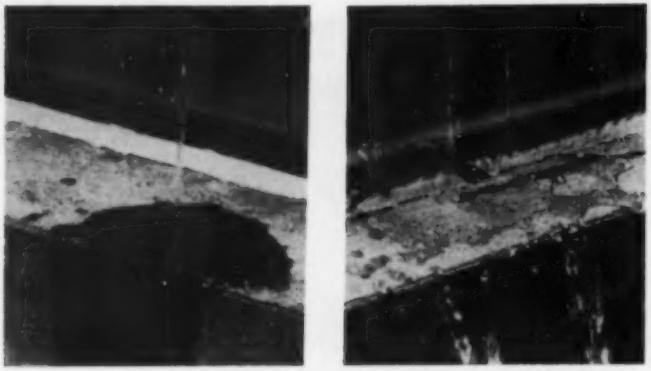
It's New . . .	It's Good For . . .	See Page . . .
Herbicide	Killing weeds and grasses in cotton fields	206A
Methylbenzyl Amines	Making amine salts, amides, emulsifying agents	206B
Emulsion Cleaner	Pressure, spray or brush cleaning of greasy surfaces	207A
Promoted Detergent	Improved soil removal and whiteness retention in cotton	207B
Plastic Tie Plates	Competing with wear and corrosion resistance of steel	207C
Silicone Resin	Water-repellent masonry finishes	208A
Dye Intermediate	Light-fast colors	208B
Desiccant	Preventing mold, mildew, rust	208C
Curare-Like Drug	Safe method for relaxing muscles during surgery	208D
Plastic Foam	Light-weight means of refrigeration	208E
Salicylamide	Killing pain, reducing fever	210A
Resin Suspensoids	Heat-sealing and "wet stick" adhesives	210B
Rubber-Plastic	Making durable tubes for yarn spinning	212A
Recording Rubber	Magnetic recording bands stretched over a drum	212B
Ice Melter	Thawing with 30 times the efficiency of salt	212C
Water Repellent	Use during dry cleaning with synthetic solvents	212D
Fertilizer	Restoring brown-spotted lawns	212E
Herbicides	Control of annual grasses in cotton and other crops	212F
Stabilizer	Increasing the speed with which cement can seal leaks	212G

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers.



PLASTIC THAT CAN REPLACE STEEL IN TIE PLATES

(207C) **Plastic plates, now being tested by Erie Railroad, weigh ¼ as much as steel, are said to be three times as strong, promise to stand up infinitely longer against wear and corrosion. In formulating the plastic, Dynakon Corp., Cleveland, uses fiber glass as reinforcing agent for thermal setting resin. Prospective application in CPI is the replacement of stainless, hard rubber or noncorrosive materials used in pump parts.**



Water-soaked cement still, left, was not treated with new silicone resin, XR-129G.

Silicone Resin

Produces a more water-repellent, quicker-curing, less costly, masonry finish. (208A)

Masonry finishes based on Dow Corning's new silicone resin, XR-129G, are said to develop a high order of water repellency within 24 hours of application. Tests have shown it to be a durable, invisible treatment that repels water and dirt, minimizes efflorescence and reduces spalling.

In a test for water repellency, treated samples were brush coated once and allowed to air dry at room temperature for 24 hr. They were then placed in a pan with the flat, treated side down in ¼-in.-deep water. This approximates exposure to heavy rain driven by a 20-mph. wind. After 24 hr., the treated concrete absorbed only 0.2 to 0.7 percent of its weight in water compared with 7 to 8.5 percent for the untreated controls.

During efflorescence tests, sodium sulphate solution (10 percent) bloomed on the surface of untreated samples after two days. There were no signs of it on treated samples when the test was discontinued after 21 days.

Effective life of the treatment is judged to average about five years under normal conditions of exposure. Estimates are that these repellants penetrate to at least $\frac{1}{16}$ in., greatly counteracting effects of surface weathering. Also there is evidence to support the theory that this silicone surface is chemically bonded rather than mechanically attached to the masonry.

No visible change in color or texture of masonry results from the silicone treatment. Its action depends on coating rather than plugging the masonry's pores. Like any other transparent or invisible water repellent, it will not exclude water under hydrostatic pressure.

Present cost of the 3 to 5 percent optimum concentration ranges from 60 to 85 c. per gal. Coverage ranges from 75 to 200 sq. ft. per gal. depending on porosity of the masonry surface. It can be applied by brushing or spraying and only one coat is required.

Dye Intermediate

For light-fast colors. (208B)

Phenyl hydrazine and oxalacetic ester go into the making of 1-phenyl-3-carbethoxy pyrasolone-5. Now in commercial production, Winthrop-Stearns' PCP has already been established as an intermediate in the manufacture of Vulcan Fast Red and a good deal of further development on light-fast colors is now under way.

Price now stands at $3.60 a pound in 250-lb. drums, and $4 a pound in smaller lots.

Desiccant

Adsorbs as much as 20 percent more moisture from the atmosphere as older forms. (208C)

Increasing the adsorption capacity of its silica-gel packaging desiccant has been an objective of Davison Chemical Corp.'s research and development department for over four years. The result is an improved product said to not only provide safe storage, but also to produce comparable results when used in smaller quantities.

Called Protek-Sorb 121, it will be used under the new military packaging desiccant specification, MIL-D-3464, which rates desiccants according to their moisture vapor pick-up. It is designed to be used by the packaging sections of various industries to prevent mold, mildew and rust normally experienced in humid conditions. The manufacturers envision a savings in metallic barriers and other vitally needed packaging materials.

Protek-Sorb 121 silica gel is a hard granular material which picks up moisture by the process of adsorption. This means that water is condensed on the surfaces of the silica gel particles. Although the material somewhat resembles sand, it possesses millions of pores which offer a surface of approximately 50,000 sq. ft. per cu. in. of silica gel.

Curare-Like Drug

More potent, safer than curare for relaxing muscles in surgery. (208D)

A new drug called Mytolon has been developed and will soon be introduced nationally by Winthrop-Stearns. It makes deep anesthesia unnecessary when muscles must be relaxed in the course of surgery. It has proved more potent and safer than natural curare which has been used in diluted and modified form for such purposes.

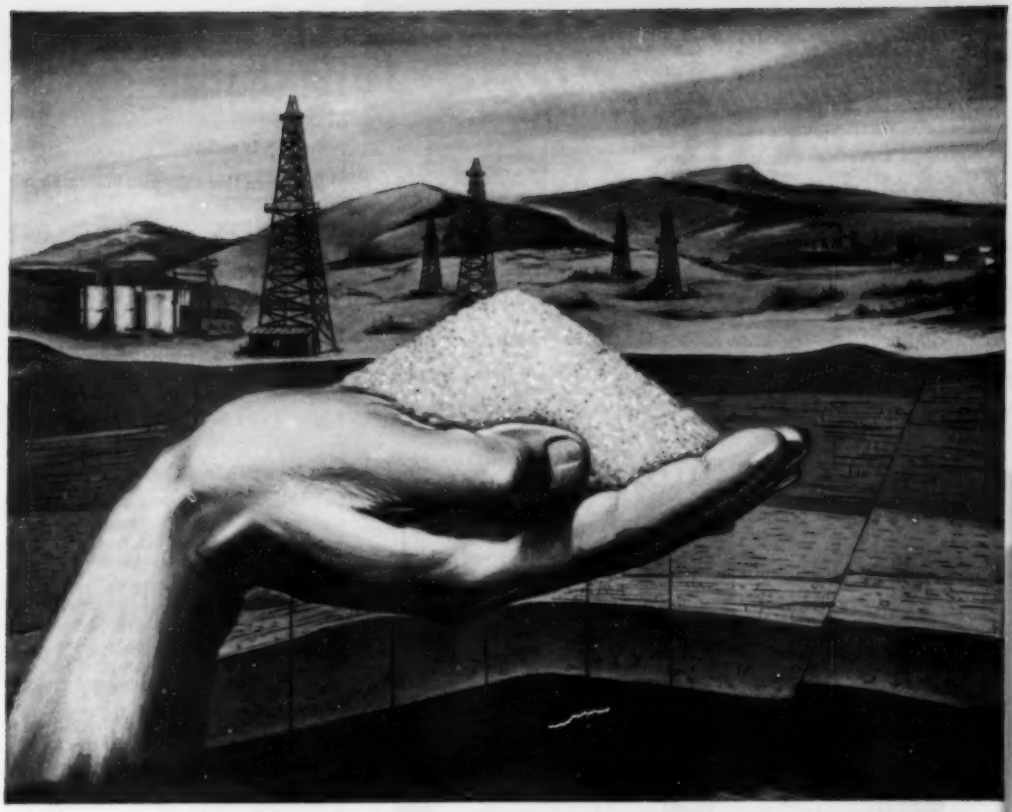
Chemically, Mytolon is 2,5-bis-(3-diethylaminopropylamino)-benzoquinone-bis-benzylchloride. It is red crystalline solid.



Plastic Foam Insulation

Developed by the motion picture industry for film-shipping containers. (208E)

Rigid Styrofoam made by Dow doubles refrigeration time and cuts 60 percent of the weight of fiber drums for preserving undeveloped film during shipment in hot climates. A dou-



"Lift-up powder" for tired oil wells

How Celite filtration helps boost oil output

To BOOST THE OUTPUT of "tired" oil wells bordering on the limit of economic production, profit-conscious operators inject water under extreme pressure into the porous oil sandstone and force out the accumulated oil. But first, they filter this repressurizing water with Celite® to remove the suspended solids which would eventually clog the microscopic pores of the sandstone, thus blocking the flow of water. *All waters contain at least a trace of these troublesome impurities.*

Celite's ability to do an exceptional filtering job can be attributed to these important factors which make it unique among filter aids:

Carefully processed from the purest deposit of diatomaceous silica known, Celite is available in nine standard grades—each designed to trap out suspended impurities of a given size and type. Whenever you reorder, you are assured of the same uniform, accurately graded powder received in your initial order. Thus, with Celite, you can count on consistent clarity in your filtrates—at highest rate of flow—month after month, year after year.

The secondary recovery of oil by water flooding is just one of many processes in which Celite has provided the absolute clarity vital to a successful operation. The proper grade of Johns-Manville filter aid will assure you the same results—regardless of the product or process involved. To have a Celite Filtration Engineer study your problem and offer recommendations, simply write Johns-Manville, Box 290, N.Y. 16. No cost or obligation.

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ble inner compartment (for film and ice) is insulated and supported by 4 in. of plastic foam.

Salicylamide

Seven times the pain killer aspirin is. *(210A)*

Commercial quantities of salicylamide are now being made by Heyden Chemical Corp., New York. According to the company's tests, its pain killing potency is twice that of antipyrine and seven times that of aspirin.

In contrast to other salicylates, salicylamide is said to be consistently well tolerated in high dosages. It has proved very effective in reducing fever.

Polyamide Resin Suspensoids

Oil and water resistant heat sealing adhesives and coatings. *(210B)*

Expanded production of polyamide resin suspensoids has been announced by General Mills. The suspensoids are opaque white, water suspensions of the company's heat-sealing polyamide resins.

They have found their largest volume use as heat-sealing adhesives and coatings. Individual formulations seal firmly to a wide variety of surfaces, including paper, cloth, cellophanes, metal foils, glass, leather, cork, wood and plastics and plastic films. Like the resins from which they are made, they are resistant to greases, oils, water and water-vapor.

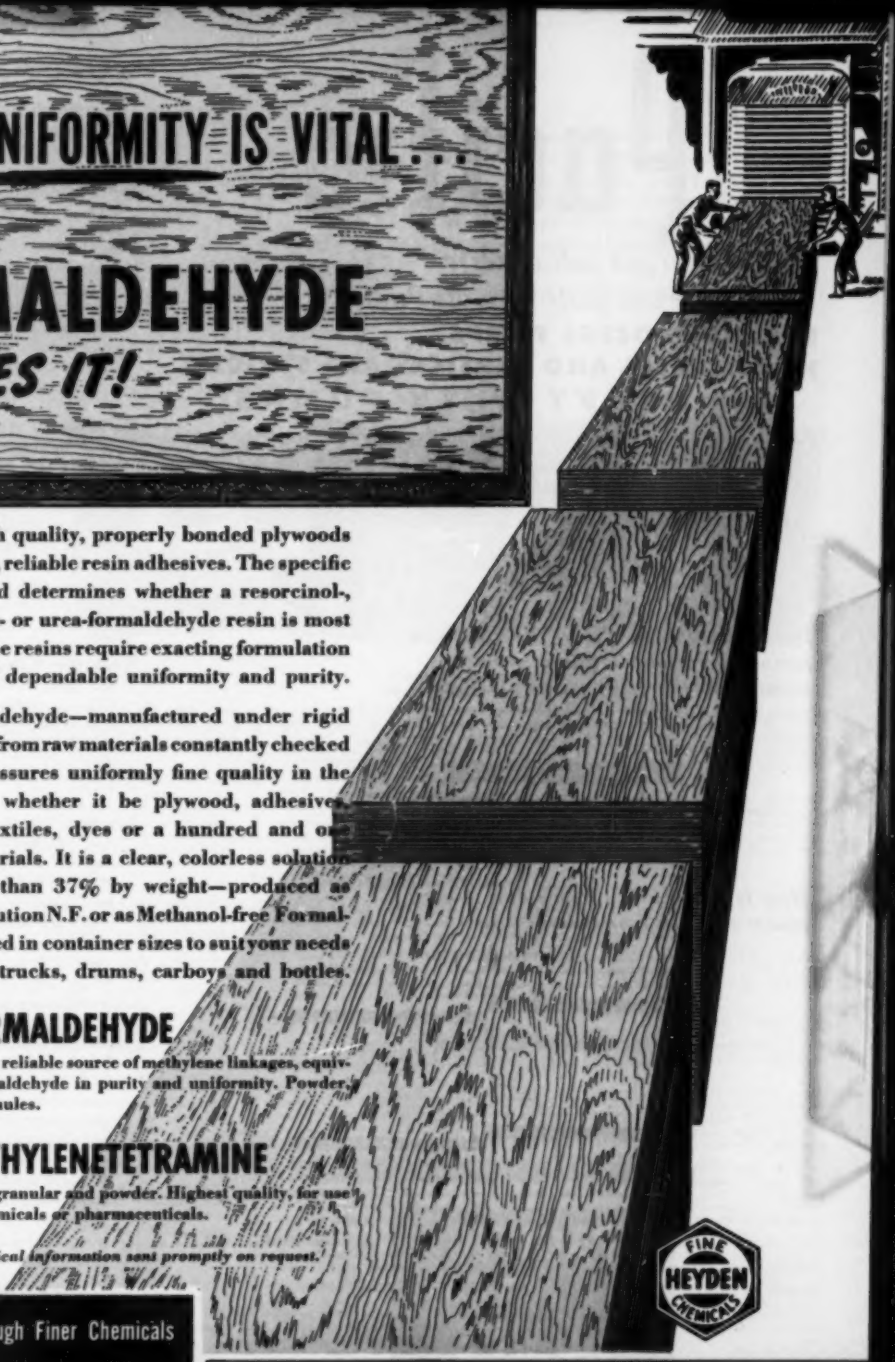
Recently, the suspensoids have also worked their way into so-called "wet stick" adhesives. And they show promise as soil-resistant coatings for textiles, as protective and decorative coatings, as beater additives and tub sizes for paper and as binders for sawdust, textile fibers, pigments.

The polyamide resins themselves are formed by the condensation of dimerized vegetable oil acids with ethylene diamine. When applied as suspensoids, they form opaque, white films composed of discrete particles, indistinguishable to the naked eye. When heat-fused, these films become continuous.

Tough new rubber-plastic, a blend of nitrile rubber and a styrene acrylonitrile resin, is going into a specially designed tube for carrying yarns in the spinning of cotton and the newer synthetic fibers. A U. S. Rubber product, its outstanding impact

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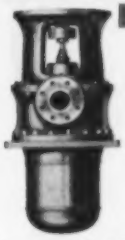
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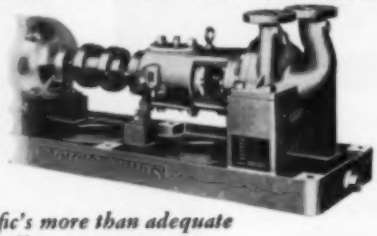
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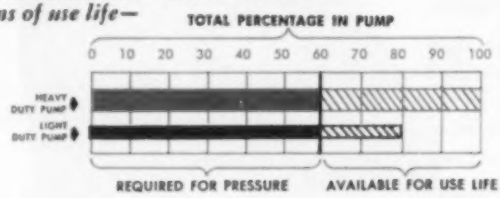
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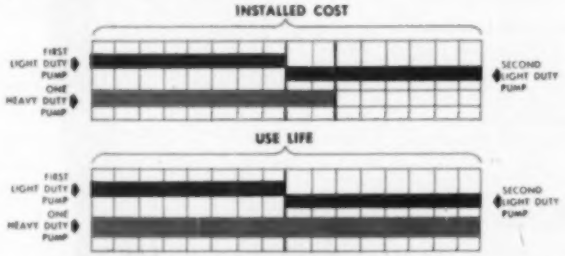




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NEW PRODUCTS, *cont. . .*

strength should sharply reduce replacement rate of these tubes. *(212A)*

New magnetic recording rubber made from a special neoprene base has been developed by Brush Development Co., Cleveland. Magnetic oxide has been pigmented into the neoprene with a good degree of uniformity. Included in the base material is a permanent lubricant said to eliminate wear of both medium and associated recording head. *(212B)*

An improved type of Melt, ice and snow-melting chemical pellets said to have 30 times the thawing capacity of salt, has been announced by Chem Industrial Co., Cleveland. The new product consists of slightly smaller pellets. However the manufacturer advises that because each is 99 percent active chemically, it produces greater exothermic action than previously offered material. *(212C)*

Renewable water repellent for direct use in dry cleaning equipment employing synthetic solvents has recently been put on the market by Du Pont's organic chemicals department. Trade name is Aridex PER. *(212D)*

Fertilizer combined with vermiculite and compressed peat moss, now being sold in the Pacific Coast states, retains 1 gal. of water per lb. Made by Fortified Farm Products Co. and trade-named Nitro-Mulch, it is mainly intended to restore brown-spotted lawns. Price is $5.95 for a 50-lb. bag. Sales will be extended to other areas shortly. *(212E)*

Hericidal evaluation research of the Dept. of Agriculture at Beltsville, Md., has screened out three new compounds which hold promise as pre-emergence sprays for control of annual grasses and certain broadleaf weeds in cotton and other crops. Not yet available commercially, the compounds are 3 chloro isopropyl-N-phenyl carbamate, 3 (p-chlorophenyl) 1-1-dimethylurea, and dichloral urea. *(212F)*

New stabilizing ingredients has been added to Flextite, product of Flexrock Co., Philadelphia. Result is more speed in sealing off leaks, water seepage in concrete walls. A liquid chemical to be mixed with cement or cement and sand, Flextite produces a mortar that is easily handled, fast-setting. *(212G)*

—End



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COMMERCIAL QUANTITIES

STABILIZER 54—An organic phosphate derivative supplied as a soft white paste. *Use:* A light stabilizer for vinyl plastic films and coatings, for application in organosol, latex, and solvent formulations.

POTASSIUM TRIPOLYPHOSPHATE—*Formula:* $K_5P_3O_{10}$. Molecular weight, 448. Melting point, 620—640° C. Density, 2.54. A white crystalline solid. Solubility in water, over 140 grams in 100 ml at 26° C. pH of a 1% solution, 9.4—9.7. *Suggested uses:* The most soluble of the Victor polyphosphates, for applications in formulations containing restricted amounts of water or those requiring a high concentration of polyphosphate for detergent building, dispersing, and sequestering action.

TETRASODIUM MONOPOTASSIUM TRIPOLYPHOSPHATE—*Formula:* $Na_4KP_3O_{10}$. Molecular weight, 384. Melting point, 580—600° C. Density, 2.55. A white crystalline solid. Solubility in water, 30 grams in 100 ml at 26° C. pH of a 1% solution, 9.5—9.7. *Suggested uses:* As a builder for soaps or synthetic detergents, a sequestrant, and as a deflocculating agent for water suspensions of solid particles wherever its greater solubility compared with sodium tripolyphosphate is desired.

TRISODIUM DIPOTASSIUM TRIPOLYPHOSPHATE—*Formula:* $Na_3K_2P_3O_{10}$. Molecular weight, 400. Melting points, 620—640° C. Density, 2.48. A white crystalline solid. Solubility in water, 80 grams in 100 ml. at 26° C. pH of a 1% solution, 9.5—9.7. *Suggested uses:* The greater potassium content results in over twice the total solubility in water as compared with tetrasodium monopotassium tripolyphosphate. It is recommended for use where greater solubility is an advantage, with the usual excellent detergent building, deflocculant, and sequestrant characteristics of the polyphosphates.

VICTAWET 14—*Formula:* $R\text{-}O\text{-}\overset{O}{\overset{\|}{P}}(OX)_2$. R = alkyl. X = solubilizing group. Molecular weight, about 500. Melting point, below 0° C. Boiling point, decomposes. Specific gravity 1.12 at 25° C. Draves sinking time (0.2%), 30-40 seconds. Yellow liquid, neutral and nonionic, which dissolves in water to form a slightly cloudy solution. *Suggested use:* Nonionic wetting agent.

VICTAWET 34-B—Sodium salt of an alkyl phosphate. A soft white paste containing about 30% water. Readily soluble in water forming a clear foaming solution. Draves sinking time, 15-20 seconds (0.2% soln). *Suggested use:* Anionic type wetting agent.

SEMICOMMERCIAL QUANTITIES

Di-iso-OCTYL PHENYLPHOSPHONATE—*Formula:* $C_6H_5\overset{O}{\overset{\|}{P}}(OC_8H_{17})_2$. Molecular weight, 382. Melting point, below 0° C. Boiling point, 180-190° C. (1 mm.). Specific gravity, 0.973 at 25° C. Refractive index, $n^{25}D$ 1.4789. A water white neutral ester, insoluble in water but miscible in all proportions with the common organic solvents. Relatively stable to hydrolysis, particularly in alkaline media. *Suggested uses:* Plasticizers, lubricants, or hydraulic fluids.

Di-iso-OCTYL STYRYLPHOSPHONATE—*Formula:* $C_6H_5C_2H_3\overset{O}{\overset{\|}{P}}(OC_8H_{17})_2$. Molecular weight, 408. Melting point, below 0° C. Boiling point, 185-190° C. at 1 mm. Specific gravity, 0.977 at 25° C. Refractive index, $n^{25}D$ 1.4994. A yellow, slightly viscous neutral ester, insoluble in water but miscible in all proportions with the common organic solvents. Relatively stable to hydrolysis, particularly in an alkaline medium. *Suggested uses:* Plasticizers, lubricants, or hydraulic fluids.

DI - n - PROPYLPHOSPHOTHATE CHLORIDE—*Formula:* $(n\text{-}C_3H_7O)_2\overset{S}{\overset{\|}{P}}Cl$. Molecular weight, 216.67. Specific gravity, 1.123 at 25/4° C. Boiling point, 70-75° C. at 1 mm. Refractive index, $n^{25}D$ 1.4672. A water white liquid. Quite stable to water at ordinary temperatures. *Suggested uses:* Intermediate for organic synthesis.

TRI-n-PROPYL PHOSPHATE—*Formula:* $(C_3H_7O)_3PO$. Molecular weight 224. Boiling point, 97° C. at 4 mm. Specific gravity 1.002 at 25/4° C. Refractive index, $n^{25}D$ 1.4139. A water white liquid. Soluble in common organic solvents. Slightly soluble in water. *Suggested uses:* Plasticizers, solvents.

DIBUTYL PHOSPHITE—*Formula:* $(C_4H_9O)_2\overset{O}{\overset{\|}{P}}H$. Molecular weight, 194. Boiling point, 72° C. at 0.5 mm. Refractive index, $n^{25}D$ 1.4228. Specific gravity, 0.986 at 25/4° C. A water white liquid. The active hydrogen reacts with alkaline metals as well as with chlorine. It also adds to certain organic double bonds. *Suggested uses:* Intermediate in organic synthesis, solvents, reducing agents.

DIETHYL PHOSPHITE—*Formula:* $(C_2H_5O)_2\overset{O}{\overset{\|}{P}}H$. Molecular weight, 138. Boiling point, 50-51° C. at 2 mm. Specific gravity, 1.069 at 25/4° C. Refractive index, $n^{25}D$ 1.4061. A water white liquid. It reacts with sodium to form diethyl sodiophosphite, with chlorine to form diethyl chlorophosphate. The active hydrogen atom adds to some types of double bonds in organic compounds forming phosphorus to carbon linkage. *Suggested uses:* Intermediate in organic synthesis, reducing agent, solvents.

DI-2-ETHYLHEXYL PHOSPHITE—*Formula:* $(C_8H_{17}O)_2\overset{O}{\overset{\|}{P}}H$. Molecular weight, 306. Boiling point, 150-155° C. at 2—3 mm. Specific gravity, 0.929 at 25/4° C. Refractive index, $n^{25}D$ 1.4413. A water white liquid. The active hydrogen reacts with alkali metals and chlorine. *Suggested uses:* Intermediate for organic synthesis, solvents, oil additives.

BORON PHOSPHATE—*Formula:* BPO_4. Melting point, above 1200° C. Density, 2.52. A white water insoluble acid resistant powder. Ignition loss less than 1.5% . P_2O_5 at least 66.5% . *Suggested uses:* Ceramics, enameling compositions, acid resistant coatings.

BOROPHOSPHORIC ACID—*Formula:* $BPO_4.H_2O$. Melting point, decomposes. Density, 1.873. A white water soluble, crystalline, nonhygroscopic solid. Ignition loss, 18.5% . pH of a 1% solution, 2.0. Equivalent to 79% orthophosphoric acid. *Suggested uses:* For non-food applications, this compound is equivalent to a solid nonhygroscopic form of orthophosphoric acid.

VICTOR CHEMICAL WORKS

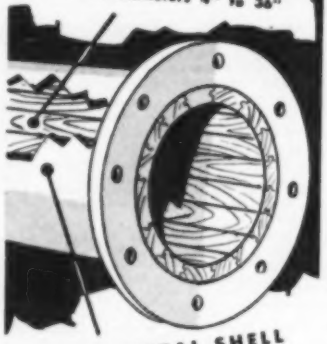
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Chemicals 214D	. . . use synthetic organic chemicals made by this company. Condensed data on applications and physical properties in tabular form on more than 300 products, 25 of which are new in this 1952 edition. 16 pages.	Carbide and Carbon Co.
Pumps 214E	. . . install, operate and maintain vertical turbine pumps. First section of the manual contains fully labeled and described cutaway drawings of parts of various assemblies. Necessary steps before installation are the subject of the second section, while a third covers installation—oil lubricated pumps. Both are well illustrated with photographs. 40 pages. Another bulletin covering only water-lubricated turbine pumps contains a large fold-out drawing showing internal construction. 8 pages.	Johnston Pump Co.
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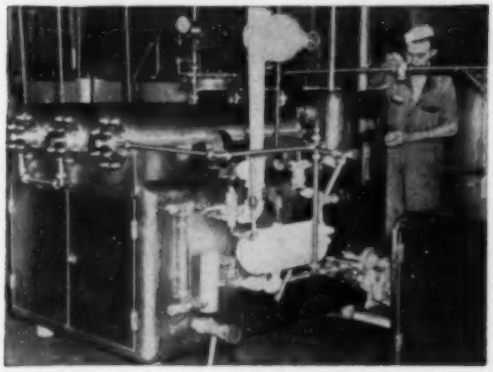
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Edible oil products are emulsified, crystallized, and tempered in this installation. In addition, VOTATOR Heat Transfer Apparatus can be used in crystallizing such materials as paraffin wax, paradichlorobenzene, paranitrochlorobenzene, anthracene, naphthalene, acetic anhydride, potassium perchlorate, sodium chlorate, microcrystalline wax, fatty acids, and in the winterizing of linseed oil.

VOTATOR Heat Transfer Apparatus provides rapid and uniform crystallization of organic or inorganic viscous materials. Labor savings are substantial, since less handling is required, and the continuous processing operation is completed in a matter of seconds.

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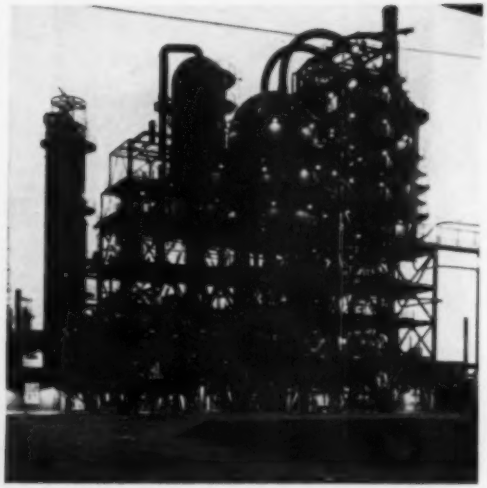


VOTATOR—T.M. Reg. U.S. Pat. Off.

THE GIRDLER CORPORATION
Votator Division



Wind-box of spray dryer through which hot air is forced. Spray drying of catalyst makes uniform small spheres possible.



Fluid catalytic crackers such as this can now operate with less catalyst loss resulting from inter-particle attrition.

Microspheroidal Cracking Catalyst

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Microspheroidal is the name for the new shape being given fluid cracking catalysts these days. The rounded surfaces of the small particles make them more resistant to inter-particle attrition while they go about their jobs of cracking heavier hydrocarbons to produce aviation and motor gasoline.

Key to process

Spray drying is the key to the new process. It provides a more uniform particle size than possible by the earlier method of grinding and sizing the silica-alumina material. Loss of relatively expensive catalyst is reduced.

Silica-alumina catalysts have been found by experience to be best for catalytic cracking operations. In Davison's new plant at Cincinnati, weak solutions of sodium silicate and sulphuric acid are brought together in a special mixer to give a hydrosol which sets in a few minutes to form a hydrogel of silica and water. To introduce the alumina, aluminum sulphate solution is added which impregnates the hydrogel. Aqua-ammonia precipitates the alumina.

Slurry handling

Slurry containing silica, alumina, ammonium sulphate, sodium sulphate and other impurities is pumped to a drum-type filter where all surplus liquid is removed.

Cake from the filter is mulled in paddle-type equipment to give a slurry which is pumpable but which will harden if it is not kept thoroughly agitated. The mulled silica alumina slurry is pumped in equipment capable of developing 5,000 psi. through a series of nozzles located in the top of a spray drier. This unit is cone-shaped, 22 ft. diam. by 50 ft. high.

Washing

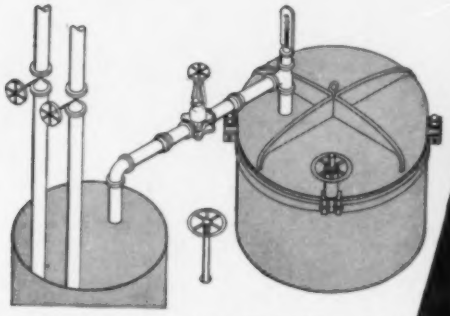
When the slurry leaves the nozzle it is in very fine droplets formed by the high pressure and the design of the nozzle. These droplets pass down through a stream of hot flue gases moving in the opposite direction. The exit gases from the dryer pass through water scrubbing equipment to remove any catalyst carried out of the spray chamber. Complete recovery of the product is made.

Every bit of the dried catalyst which discharges from the bottom of the spray dryer must be washed to remove ammonium sulphate, etc. This is accomplished by washing the material on a horizontal vacuum filter. This is a stainless steel unit 15 ft. in diameter with vacuum pumps and pumps for recycling the solution around the filter according to a predetermined schedule.

Drying

Material discharged from the horizontal filter contains 50 percent water and 50 percent catalyst. This is dried to remove the larger portion of water in a typical direct fire rotary unit which is equipped with cyclones and other auxiliaries that are associated with large rotary dryers. The material leaving this rotary dryer goes to storage and constitutes the spray dried microspheroidal catalyst. The finished product is shipped to customers by rail in covered hopper cars.

for outstanding service like this



The Installation—Phoenix Dye Works, Chicago, Ill.

PROBLEM: To find a durable replacement valve for dye line on package dye machine. Various cocks and valves tried, lasting only a maximum of 1 to 2 months, with much leakage, sticking, and maintenance.

WORKING CONDITIONS: Valve almost constantly in contact with varying acid dye solutions, at temperatures ranging from 50 to 210 degrees F. Operated about 100 times daily, often with disc in throttling position.

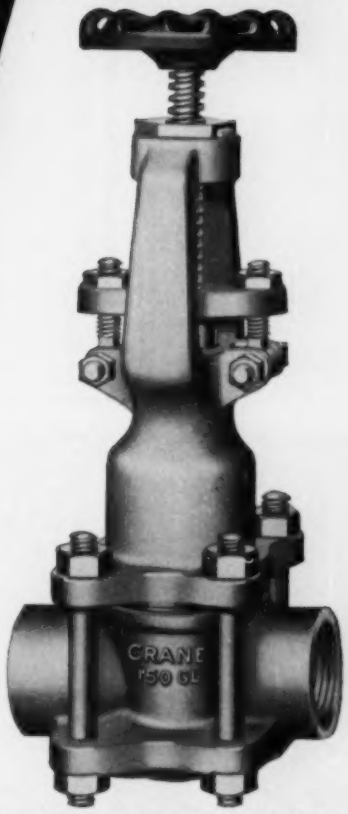
SOLUTION: Crane No. 18850, all 18-8 Mo Stainless Steel Plug Gate Valve.

RESULT: User reports: after more than 3 years' uninterrupted service, no leakage through valve . . . no sign of corrosion . . . no maintenance expense . . . unusually easy operation. Enthusiastic about performance of Crane Plug Gate Valves.

. . . Another typical example of the long life and low-cost upkeep that Crane Quality Valves are famous for. And that's why . . .

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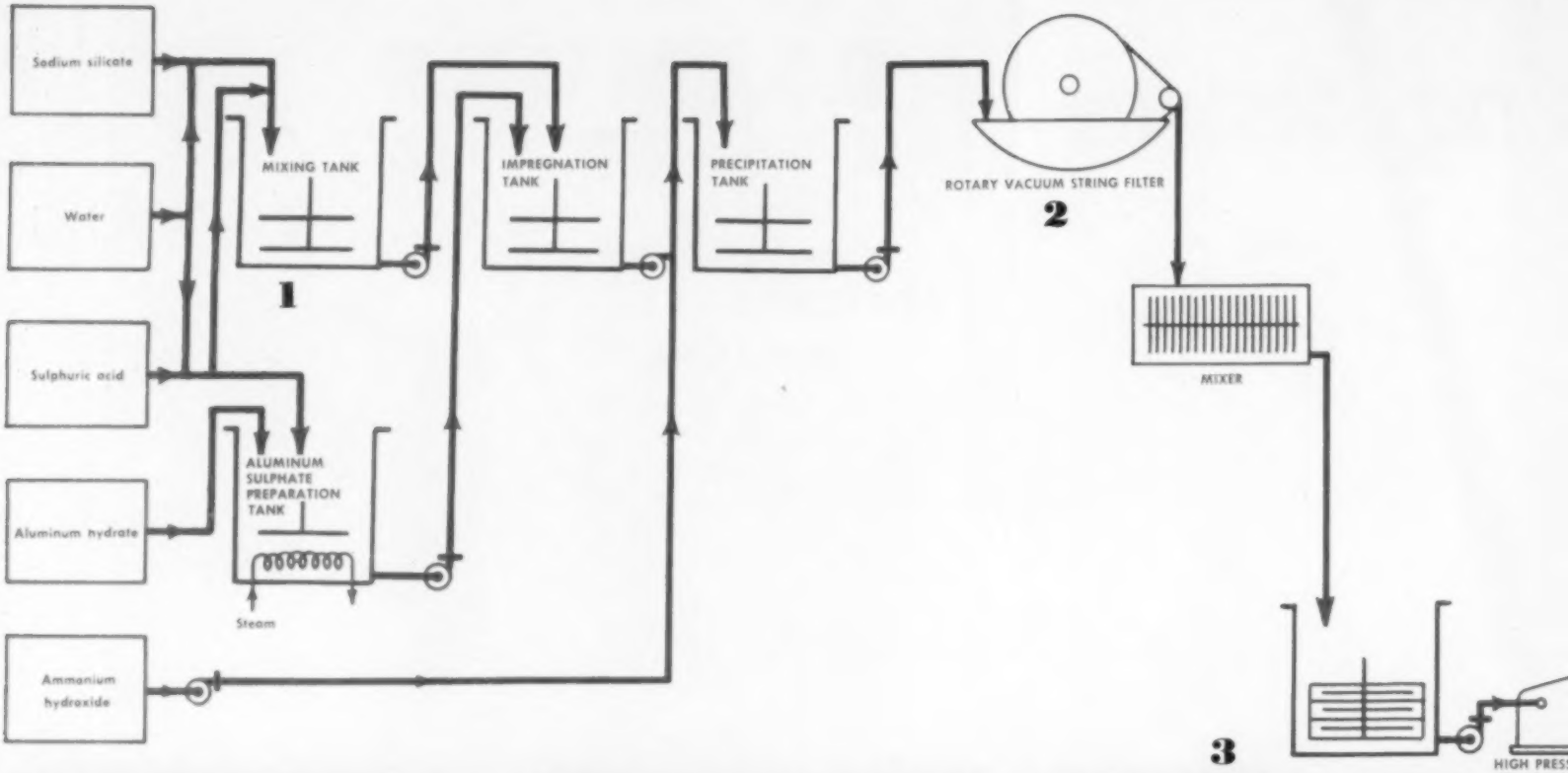


No. 18850 Crane 18-8 Mo Plug Gate Valve for throttling or full-flow service. (No. 17750 in Monel.) Send for new folder AD-1855.

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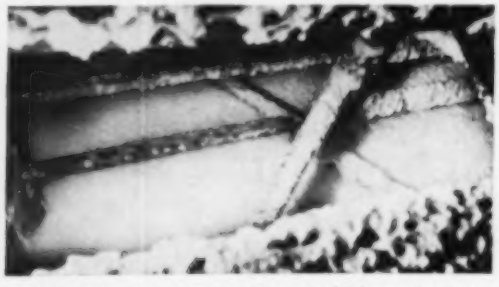




1 In first mixing tank, agitator paddles prevent setting up of hydrosol formed from sodium silicate and H_2SO_4.



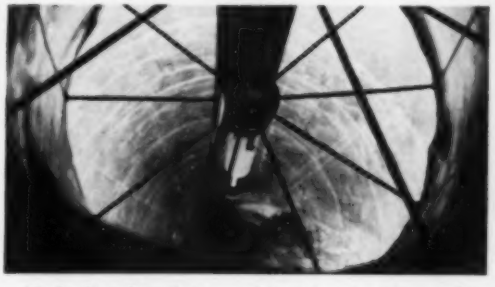
2 Rotary string filter removes surplus liquid from hydrogel. Dewatered gel is then mulled in paddle-type mixer.



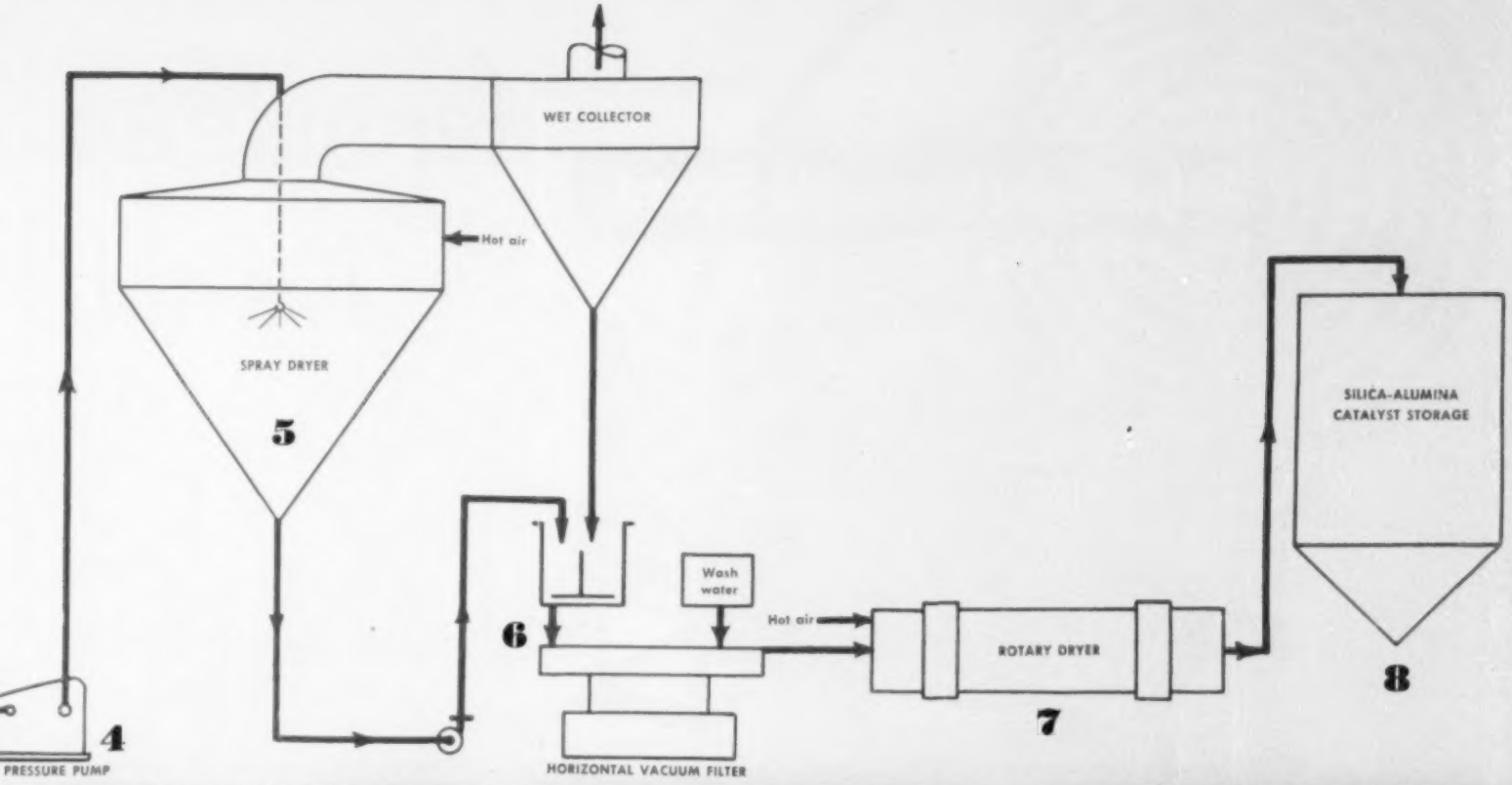
3 Double-motion agitator with cutting blades moving in opposite directions in feed tank to spray dryer.

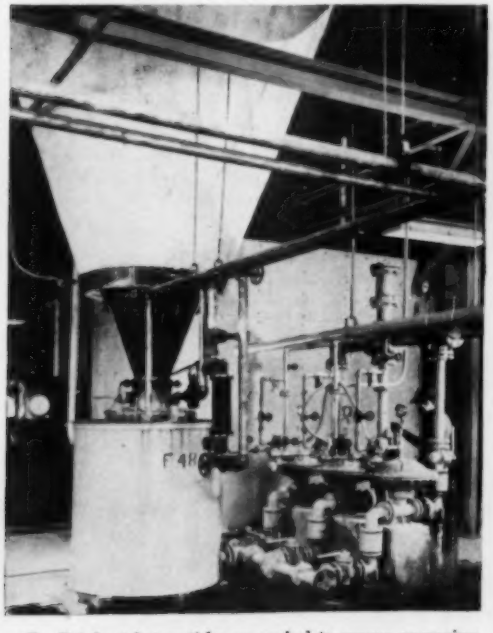


4 Reslurried hydrogel is pumped into spray dryer by this high pressure pump, capable of developing 5,000 psi.

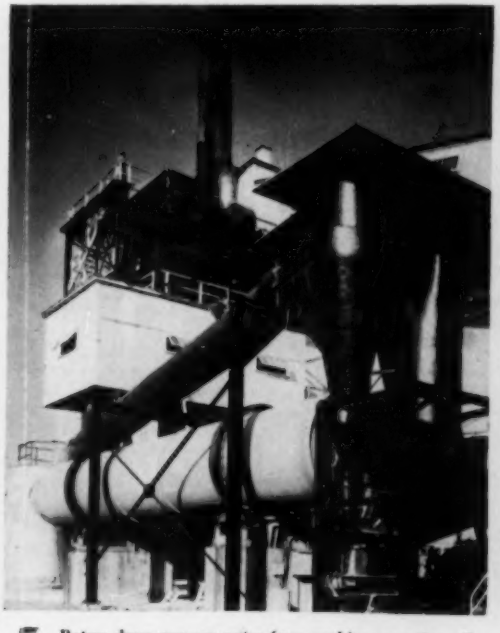


5 Looking down into spray dryer, where hot air evaporates water from droplets emerging from spray in center.

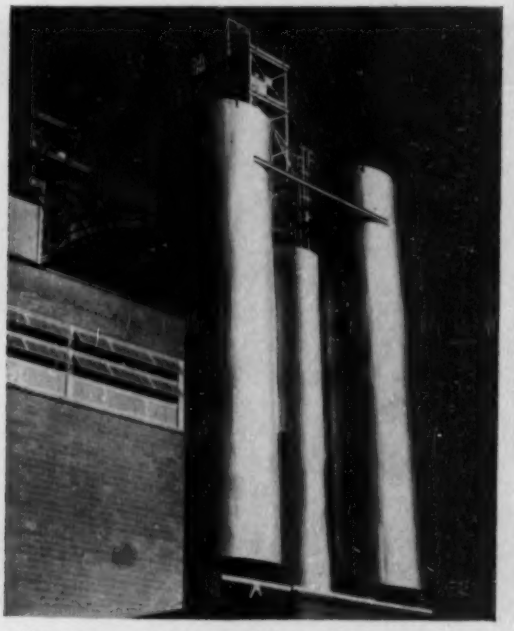




6 Dried catalyst particles are washed to remove ammonium sulphate, etc. on the horizontal vacuum filter.



7 Rotary dryer removes water from washing operation. Cyclones separate finished product from flue gases.



8 Silos store finished product prior to shipping out in covered hopper cars. Large silos hold 160 tons.

Infinitely Variable Speed



40" Hydraulic Drive Center-Slung Centrifugal illustrated.

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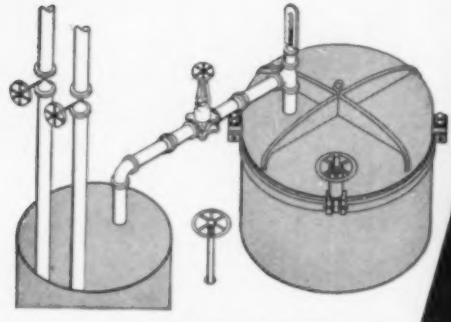
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The Installation—Phoenix Dye Works, Chicago, Ill.

PROBLEM: To find a durable replacement valve for dye line on package dye machine. Various cocks and valves tried, lasting only a maximum of 1 to 2 months, with much leakage, sticking, and maintenance.

WORKING CONDITIONS: Valve almost constantly in contact with varying acid dye solutions, at temperatures ranging from 50 to 210 degrees F. Operated about 100 times daily, often with disc in throttling position.

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RESULT: User reports: after more than 3 years' uninterrupted service, no leakage through valve . . . no sign of corrosion . . . no maintenance expense . . . unusually easy operation. Enthusiastic about performance of Crane Plug Gate Valves.

. . . Another typical example of the long life and low-cost upkeep that Crane Quality Valves are famous for. And that's why . . .

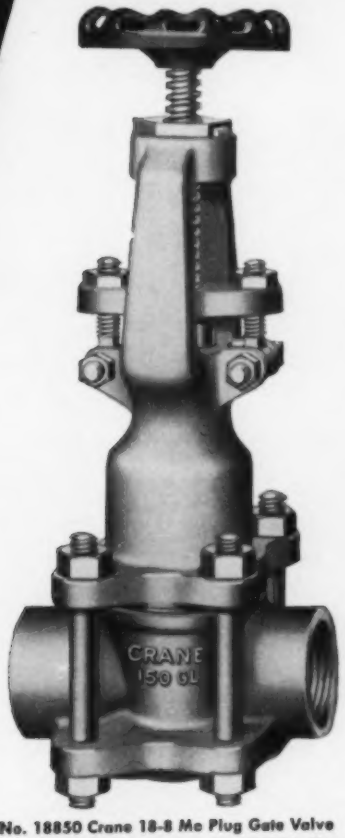
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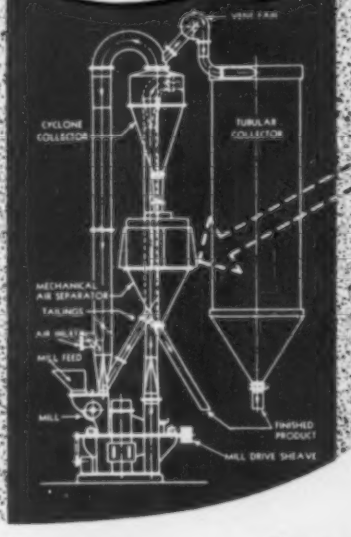
No. 18850 Crane 18-8 Mo Plug Gate Valve for throttling or full-flow service. (No. 17750 in Monel.) Send for new folder AD-1855.

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AT LEFT: Typical set-up for Raymond Mechanical Air Separator in closed circuit with a grinding mill.

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Whizzer Separation **not only greatly increases total output, but maintains product uniformity within narrow limits to meet the most rigid finess specifications. Raymond Whizzer Separators are especially useful for making consistent end products in the range of 50 mesh to about 99.9% or better passing 325 mesh. They are equally adaptable to dedusting a material to remove objectionable fines.**

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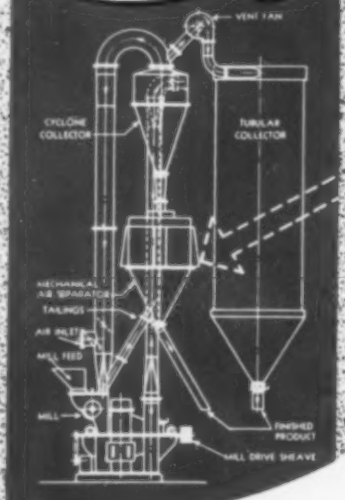
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RAYMOND WHIZZER SEPARATION

The key to
TOP LEVEL SPECIFICATIONS
in making
POWDERED PRODUCTS





AT LEFT: Typical set-up for Raymond Mechanical Air Separator in closed circuit with a grinding mill.

Here is a unit which will insure economical production of powdered materials when used in closed circuit with a grinding mill.

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Stacks Are Getting Taller

The world's tallest chimney at El Paso towers 611 ft. above its base. Tall stacks are now known to be a practical way to eliminate pollution at the ground level.

Smelter stacks are getting taller. This trend is brought into sharp focus by the new 611-ft. chimney at the El Paso plant of American Smelting & Refining Co.

This towering concrete tube didn't just happen to stop at 611 ft. It was designed—for very good reasons—to go that high and no higher.

Under the meterological conditions at El Paso and the operating conditions at the smelter, AS&R engineers calculated that 611 ft. would do the trick in doing away with objectionable SO_2 pollution of the atmosphere, even under most adverse conditions.

How Did They Know? Engineering know-how backing up the design of the El Paso chimney goes back over almost half a century.

Since 1914 AS&R's agricultural research department has been studying atmospheric pollution and how to do away with it. And since 1899 the Custodis Construction Co., who built the El Paso stack, has been designing and building industrial chimneys.

AS&R researchers slowly built up data that proved tall stacks were effective in overcoming the objectionable concentrations of effluent gases at the ground level. More important, they pieced together the reasons why. The relations between chimney design and harmful pollution from SO_2 were reduced to engineering terms.

Over the years smelter stacks grew taller, paralleling the findings of the researchers. At AS&R's Murray smelter in Utah, for instance, the 1910 stack was 200 ft. high. In 1914 it was upped to 350 ft. Even then at times the SO_2 reaching the ground was enough to injure plants.

So the Murray stack was raised to 455 ft. Only rarely—during dead calms lasting hours—did the SO_2 then reach the ground in objectionable concentrations. These rare occasions were eliminated when a coal burner at the base of the stack heated the gases to as much as 165 deg. F. above the air temperature.

For years the 573-ft. stack at AS&R's Tacoma smelter was the world's tallest. Then Anaconda Copper Co. built one 589 ft. high (also on a bench several hundred feet above the valley floor) at Anaconda that did away entirely with objectionable SO_2 concentrations.

In 1937 AS&R upped its Selby, Calif., chimney from 146 ft. to 605 ft. Then late last year the record-breaking 611-ft. unit at El Paso was completed. Bottom outside diameter of this stack is almost 45 ft.; at the top it's close to 15 ft. Wall thicknesses at the bottom and top are 2½ in. and 9 in., respectively.

Interior of the stack was painted with a special coal-tar paint to protect the concrete from possible attack by corrosive gases. The El Paso smelter gases may contain from 0.5-1.0 percent SO_2.

Laws of Tall Chimneys: From decades of experimentation and experience, general rules governing gaseous dispersion from tall chimneys have been formulated; these dictated that the El Paso stack should be at least 600 ft. high. They are:

1. Smoke concentration at the ground level reaches its peak at a distance of about ten times the height of the chimney.

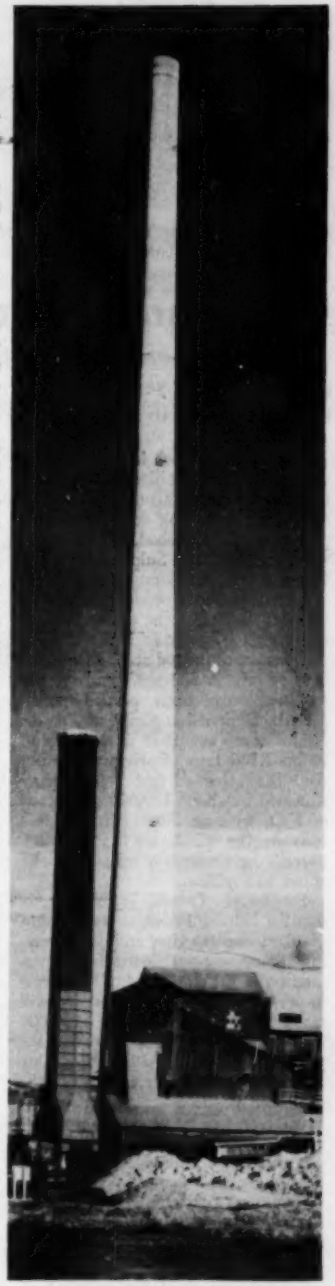
2. Concentration at that peak area varies inversely as the square of the chimney height; its actual value is then almost independent of assumptions on the variation of diffusion coefficient with height.

3. Concentration at ground level falls off beyond the area of maximum concentration until after about 50 chimney heights it varies as the inverse square of the distance and is independent of chimney height.

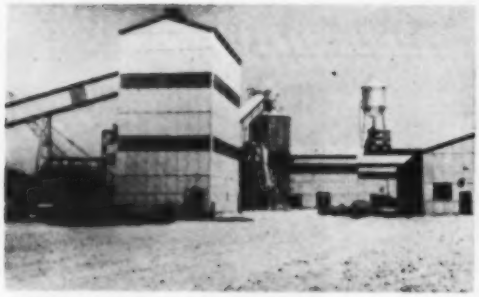
4. Stack temperature has a decided effect on the buoyancy and dispersion of the effluent gas; each 1 deg. F. of added stack temperature is equivalent to 2.5 ft. of added stack height.

One pound of SO_2 at air temperature from a chimney 10 ft. high will reach the ground in the same concentrations as 6,000 lb. of SO_2 from a 500-ft. stack at 110 deg. F. above air temperature.

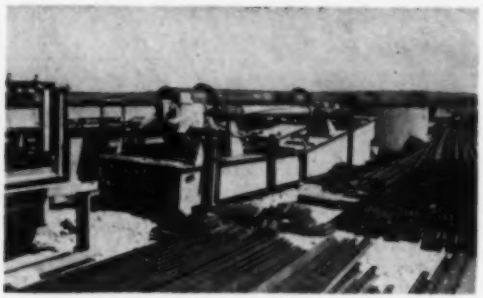
Thus the dispersive action of *tall* stacks and *hot* gases, now fully recognized, is the reason why smelter chimneys are getting taller.



WORLD'S TALLEST



NEARING COMPLETION at Carlsbad, N. M., is refinery of Duval Sulphur & Potash Co., to be operating early next year.



UNDER WAY is work on classifier, dryers, rail and float machine at plant of Southwest Potash Corp., to run next July.

New Plants Mean More Potash

Two newcomers to Carlsbad expect to be turning out potash by next year. Together with other producers, they'll help lift output to catch up with climbing demand.

Demand for potash has outstripped supply for the past decade. Spurred by this mounting demand, two new companies will soon start producing potash in the Carlsbad, N. M., area. They are the Duval Sulphur & Potash Co. and the Southwest Potash Corp.

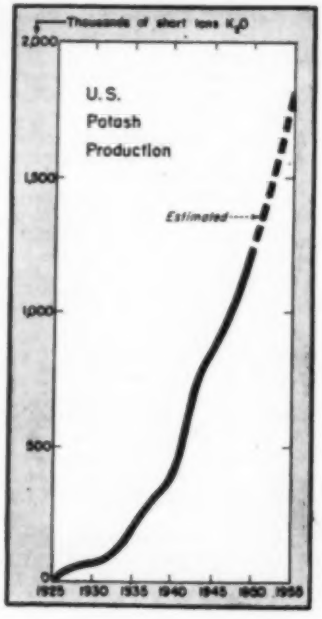
First to get into production will be Duval, which expects to be turning out potash by January 1952. Duval's reserves are estimated at 17-18 million tons of ore. A first shaft and ground facilities have been partially completed. Designed capacity of Duval's flotation process plant is understood to be 2,500 tons of sylvinite ore per day. It's estimated that 1952 production will be about 100,000 short tons of K_2O, with an increase to 175,000 tons as the plant reaches capacity. Duval's investment is believed to be about $10 million.

Southwest Potash is about six months behind Duval in its program of plant construction and shaft sinking. Southwest anticipates initial production in July 1952. After the break-in period of the plant, production will reach an estimated rate of 185,000 tons of K_2O annually. However, the plant has been designed to be readily expanded to a larger tonnage. The ore body has been drilled extensively. Separation will be by flotation of the sylvite. Southwest is reported to have put about $10 million into its potash venture.

Tightness of potash supply has hampered users in their defense production. The Secretary of Agriculture has warned that supplies of plant foods will not meet the demands of 1952.

U. S. consumption of potash reached an all-time high of 1,409,900 short tons of K_2O in 1950. This was an increase of about 31.7 percent over 1949 consumption.

U. S. production of potash also reached a new peak in 1950. Some 1,286,600 short tons of K_2O was produced. Even so, this was about 120,000 tons less than was consumed, the rest coming from inventory and imports.



First of the current U. S. producers was American Potash & Chemical Corp., which began production of potash at Searles Lake, Calif., around 1916. Mathieson Chemical Corp., incidentally, has just acquired a 25 percent holding of American Potash stock, a controlling interest, from Heyden Chemical Corp.

Development of the Permian Basin in the Carlsbad area of New Mexico resulted in the production of potash first by the United States Potash Co. in 1931. This was followed by Potash Co. of America's production in 1934 and International Minerals & Chemical Corp.'s production in 1940. By 1945 this trio of companies in the Carlsbad area was turning out about 85 percent of all U. S. potash. Together with American Potash, they comprise the major producers. The potash output of all other producers has been estimated to account for less than 3 percent of the U.S. total.

In addition to the two newcomers at Carlsbad, Duval and Southwest, another company, Continental Potash, has been experimenting there with a method for recovering potash by a modified Frasch process, but apparently has decided to discontinue its attempts. Other producers have also experimented with modifications of the Frasch process, but none has ever used such a method for commercial production.

Meantime, the three old-line companies in the Carlsbad area have been working hard to increase their production. Their increased output, together with the new capacity coming in, should go far to ease the current shortage. By the end of 1952, it's estimated that the industry's total capacity will be about 1,600,000 short tons of K_2O. This should be enough to satisfy currently anticipated demand and enable the potash industry to increase its service to the national economy.

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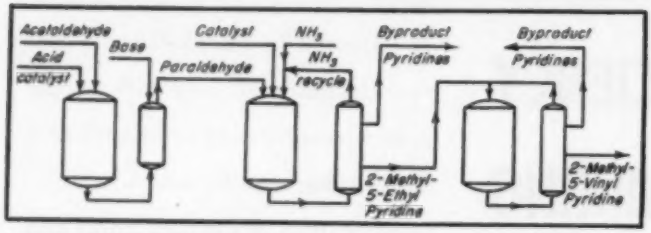
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Pyridines Tempt New Producers

Big market in synthetic fibers and niacin starts scramble into production of methyl ethyl pyridine. It will be made from acetaldehyde and ammonia by new process.

Pyridines are in for a big expansion. Demand now outruns supply, but new synthetic processes, based ultimately on natural gas and petroleum, will soon break the coal-tar bottleneck. Big new markets for pyridines are opening up in pharmaceuticals and especially in the new synthetic fibers. That's why makers of organic chemicals are going into the production of pyridines.

Key to the unfolding future of the pyridines lies in 2-methyl-5-ethyl pyridine. It can be made from acetaldehyde and ammonia. It can be used to synthesize niacin and niacinamide, freeing the manufacturers of these vitamin B compounds from dependence on pyridine and quinoline from coal. And when 2-methyl-5-ethyl pyridine is dehydrogenated it yields 2-methyl-5-vinyl pyridine, which will be used to make synthetic fibers easier to dye.

New Producers: At Institute, W. Va., the new plant of Carbide & Carbon Chemicals Co. is just about completed, may even be producing a few drums a month of 2-methyl-5-ethyl pyridine already. By January 1952, it should be getting into volume production. At the outset, the plant will probably produce about 1 million pounds a year, but it wouldn't be surprising if ultimately it produced as much as 5 to 6 million pounds per year of methyl ethyl pyridine. Much of Carbide's output can be expected to find its way into the manufacture of niacin.

As part of a $3 million expansion, Phillips Chemical Co. is building at Adams Terminal on the Houston Ship Channel, at a probable cost of about $2 million, a methyl ethyl pyridine unit that eventually will produce about 5 million pounds a year of MEP. It's expected to start running in 1952 and will hit its stride late in the year. Phillips plans initially to make about 2 million pounds per year of 2-methyl-5-vinyl pyridine by dehydrogenating the MEP. This methyl vinyl pyridine made by Phillips will be used in Chemstrand's new acrylic fiber to make it easier to dye. A versatile monomer, methyl vinyl pyridine undergoes a variety of interesting reactions; it offers promise for several industrial applications.

Byproducts from the Phillips plant, totaling about 1 million pounds a year at the outset, will include the picolines, 2,5-lutidine, 3-ethyl pyridine, 3-vinyl pyridine and pyridines boiling higher than either 2-methyl-5-ethyl pyridine or 2-methyl-5-vinyl pyridine.

Meantime, Nepera Chemical Co., a major producer of niacinamide, is just starting to produce methyl ethyl pyridine at its Harriman, N. Y., plant. As part of an expansion program, Nepera has built, at a cost of about $180,000, a methyl ethyl pyridine unit that will produce about 1 million pounds a year. Nepera will convert the MEP into niacinamide in another new unit, which cost about $240,000. Up to now, Nepera has made its niacinamide from pyridine, taking about one-third of the U. S. pyridine output. By next year, however, thanks to its synthesis of niacinamide from acetaldehyde and ammonia via methyl ethyl pyridine, Nepera will be out of the pyridine market. Its output of MEP will be captive, however.

Other companies are eyeing the big potential market for methyl ethyl pyridine. Its production would be a natural for the big manufacturers of ammonia and acetaldehyde. Companies making feedstuffs are likely producers too, since niacin and niacinamide made from MEP can be used to fortify feeds. And the coal-tar people, caught napping by the sudden shift to processes based on natural gas and petroleum, are wide-awake now. It wouldn't be surprising to see outfits like Barrett and Koppers taking a keener interest in possible production of methyl ethyl pyridine. And Reilly Tar & Chemical Corp. is investigating not only MEP, also known as aldehyde collidine, but other collidines as well.

Big Demand: By the end of 1952, consumption of methyl ethyl pyridine may be at the rate of 6 million pounds a year. Consumption is expected to climb to as high as 10 million pounds a year by 1955.

At first, consumption will be split about half and half between niacin and polymers, the latter including plastics and especially the synthetic



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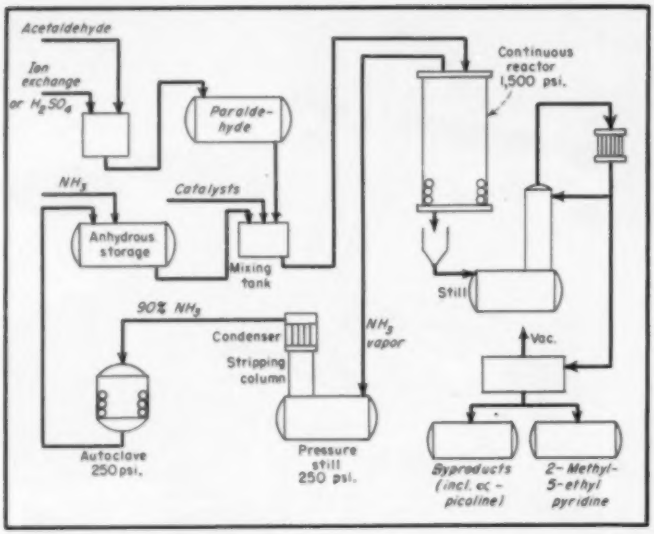
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CONTINUOUS PROCESS developed by R. S. Aries & Associates for making MEP.

fibers. But eventually the big increase will come in the fibers and in other polymers and resins. R. S. Aries & Associates, for example, has developed an anion exchange resin that is a derivative of methyl ethyl pyridine. The fact is that methyl ethyl pyridine is an almost ideal material for synthesizing plastics and organic chemicals.

Niacin: One big immediate use for MEP will be in niacin manufacture. R. S. Aries & Associates has developed a nitric acid oxidation process for converting methyl ethyl pyridine into niacin. The process gives a yield of 75 percent. Right now, niacin is made from pyridine and quinoline, principally from quinoline. Production of both of these from coal is at its peak, and even so they are scarce. Quinoline is in big demand, especially by the armed forces, for use in mildewproofing agents. This quinoline bottleneck could be broken by using a process such as that of Aries to manufacture niacin.

There's a market for 1.5 million pounds a year of niacin now, and a shortage of 500,000 lb. a year in feeds alone. The potential market for niacin could reach 5 million pounds annually; there's a big and growing demand for it in feeds, in bread, and in pharmaceuticals used in geriatrics, the new branch of medicine that deals with ills of old people.

Making MEP: Most processes for making methyl ethyl pyridine start with acetaldehyde and ammonia. The acetaldehyde is polymerized to paraldehyde, then reacted with ammonia. The methyl ethyl pyridine can be dehydrogenated to methyl vinyl pyridine for use in synthetic fibers. It can also be oxidized to the dicarboxylic acid, which is readily decarboxylated to give niacin.

Here's how Phillips will make methyl ethyl pyridine. Acetaldehyde will first be converted to paraldehyde in the liquid phase, with a small amount of an acid catalyst effecting the trimerization. This reaction is exothermic and cooling is required. Next, paraldehyde is reacted with ammonia in the liquid phase under pressure and in the presence of a catalyst to produce 2-methyl-5-ethyl pyridine and smaller quantities of other pyridine byproducts. Purification is accomplished by fractionation.

To make 2-methyl-5-vinyl pyridine, Phillips will vaporize purified MEP and catalytically dehydrogenate it at elevated temperature. Products are separated by fractionation. Unconverted 2-methyl-5-ethyl pyridine is recycled to this dehydrogenation step. An inhibitor is added to the finished product to prevent excessive polymerization during storage.

Another process for making MEP, offered by R. S..Aries & Associates, is continuous. Acetaldehyde is polymerized, either by sulphuric acid or by ion exchange. Then the paraldehyde is mixed with the ammonia and pumped into a stainless steel high-pressure reactor. There, at 1,500 psi., in the presence of a catalyst consisting of a mixture of inorganic halogen compounds, the paraldehyde and ammonia undergo a liquid phase reaction. The product goes to a separator, and then is distilled under vacuum to yield methyl ethyl pyridine and byproducts, including α-picoline.

Recycle ammonia vapor from the reactor goes to a stripping column and then to an autoclave, from which it is returned to storage for re-use. The ammonia recovery system is at 250 psi.

While an excess of ammonia is used in the actual condensation, ammonia is recycled. By weight, about six times as much paraldehyde as ammonia is consumed in the process. To make 100 lb. of methyl ethyl pyridine by the Aries method, it takes 180 lb. of paraldehyde, 30 lb. of ammonia and small amounts of catalysts.

Yield: The yield of MEP is about 80 percent. Byproducts include a maximum of 5 percent of α-picoline. The Aries organization is investigating uses for the mixture of byproducts that comprises the remaining 15 percent, and has already developed a corrosion inhibitor made from the byproduct mixture. Capital costs for the methyl ethyl pyridine process come to 40 c. a lb.

At present, methyl ethyl pyridine sells for about 50 c. a lb., but contracts for large volumes have been made at less than that price. As production increases, methyl ethyl pyridine and its derivatives will find ever widening uses, particularly in pharmaceuticals and synthetic fibers.

Complete Conversion to Cold Rubber at Port Neches

United States Rubber Co.'s copolymer plant at Port Neches, Tex., has been authorized to convert all units to cold rubber production. Cost of the project is estimated to be between $2 million and $2.5 million. Plans call for completion in eight months. Production of standard synthetic rubber will be continued during the conversion project.

The new directive supersedes an old one. Last May the government gave tentative approval for conversion from batch to continuous operation, with one new unit to be converted to the production of cold rubber and the other to the continuous output of standard rubber.

Production of the former standby plant was increased from 60,000 to 80,000 tons of standard synthetic rubber a year by installation of modern equipment during its reactivation by U. S. Rubber last year.

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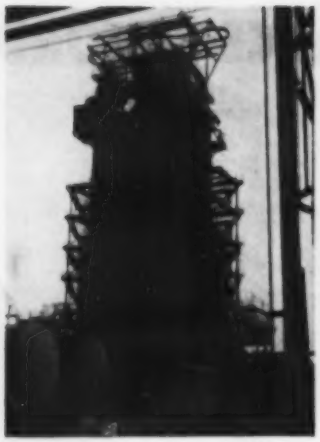
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Southwest's Chemical Bonanza

Fresh billions being pumped into the already booming Gulf Coast are hastening its transformation into the world's chemical hub. Petrochemicals catalyze boom.

There's no capping the petrochemical gusher in the Southwest. When its current $1.25 billion plant expansion is completed, chemical industry will have pumped a whopping $4.3 billion into the Southwest, about half of it for petrochemicals. But kingpins though they are, chemicals from petroleum and natural gas are only part of this boom.

This invasion of the Southwest by the chemical industry began a trend in geographic dispersion of industry in the United States. The immensity of this shift and its significance in the evolving economic and social structure of the United States will some day make it emerge as one of the great industrial movements of all time.

Petrochemicals: No industry better illustrates the changing times than does the chemical industry on the Gulf Coast. From petroleum and the vast volume of low-cost natural gas has come the production of petrochemicals, and this in turn has given impetus to the great build-up in the coastal chemical industry.

In a decade, capital investment in petrochemicals on the Gulf Coast grew from $350 million to $1.2 billion in 1945. In the last five years, investment increased to $2 billion. And now another $514 million is being put into petrochemical plants.

But petroleum and natural gas are not the whole story. Other natural resources, such as sulphur, salt and even sea water, have played a role in the growth of the great Gulf Coast chemical industry. This abundance of raw materials, plus deep water transportation, has lured makers of chemicals.

All-Out Expansion: The four states of the Southwest—Texas, Oklahoma, Arkansas and Louisiana—are fast becoming major manufacturers of chemicals. Investment in completed plants already comes to an estimated $3,050 million. The present construction program, amounting to $1,254 million, will increase the evaluation to $4,305 million.

Texas leads in value of plants with $2,113 million. This figure does not include expansion projects, new plants under construction and those on the drafting boards, which total $872 million. When this additional construction is completed the total evaluation for Texas will reach $2,984 million.

Louisiana too is attracting the chemical industry on a big scale. Its present plants are valued at about $654 million. The $320 million of projected new construction will bring Louisiana's total to $974 million.

These figures for the four southwestern states include plants for making heavy chemicals, alumina, aluminum, synthetic rubber, carbon black, salt and sulphur, as well as those parts of petroleum refineries and pulp and paper mills that produce chemicals.

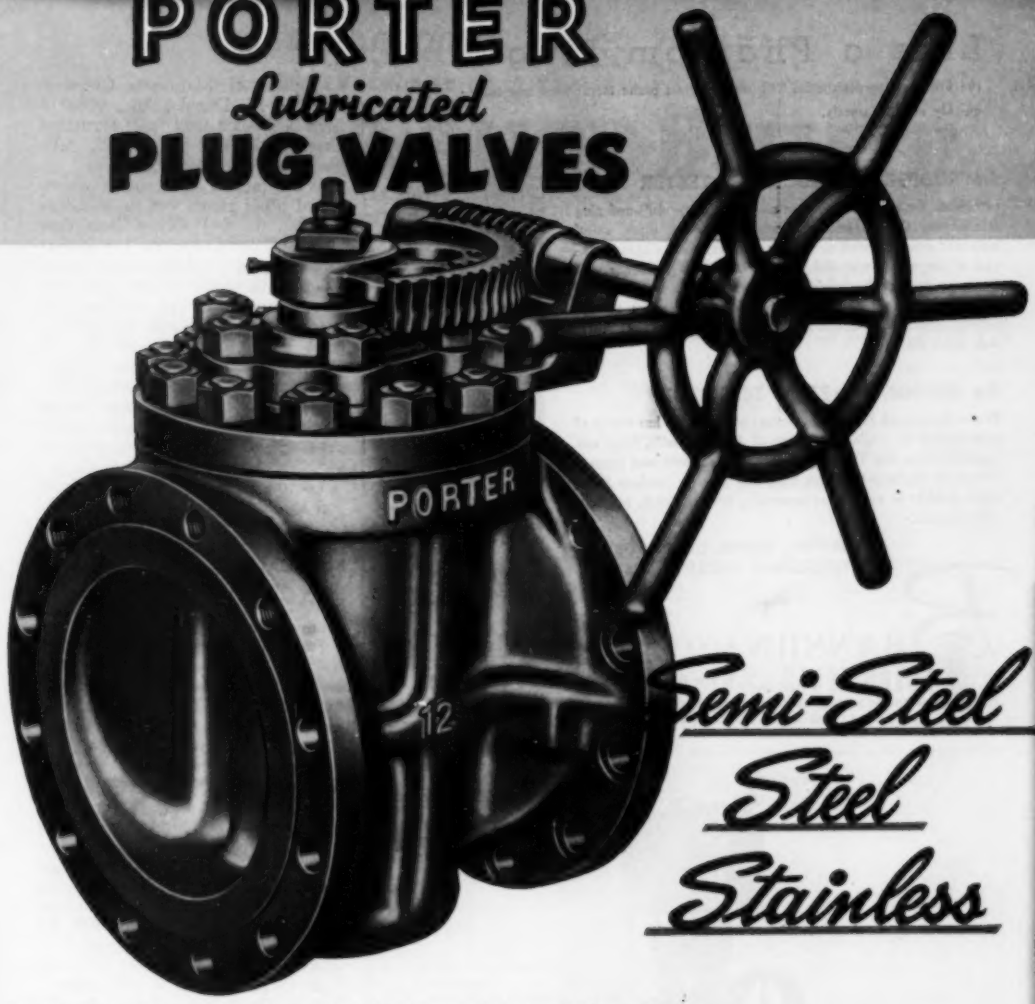
Mammoth Plants: By far the biggest chemical spread in the Southwest is the group of plants operated by Dow Chemical Co. in the Freeport, Tex., area. This group of plants is valued at $250 to $300 million.

Other plants of outstanding size include: the Texas City, Tex., plant of Carbide & Carbon Chemicals Co.; the Brownsville, Tex., plant of Carthage Hydrocol; the Deer Park, Tex., plant of Shell Chemical Corp.; the Port Neches, Tex., plant of Neches Butane Products Co.; the Orange, Tex., plant of E. I. du Pont de Nemours & Co., Inc.; the Baton Rouge, La., plants of Ethyl Corp. and Esso Standard Oil Co.; the Lake Charles,

How Southwestern Chemical Plants Are Growing

Texas	Built	Programmed	Total
Houston-Baytown	$842,470,000	$302,870,000	$1,145,340,000
Texas City-Freeport	523,050,000	140,327,000	663,377,000
Brownsville-Corpus-Port Lavaca	186,250,000	132,275,000	318,525,000
Beaumont-Port Arthur-Orange	237,400,000	48,215,000	285,615,000
Texas, elsewhere	323,500,000	248,084,000	571,584,000
Total for Texas	2,112,670,000	871,771,000	2,984,441,000
Arkansas	223,987,000	63,094,000	287,081,000
Oklahoma	59,750,000	.....	59,750,000
Louisiana	654,050,000	319,643,000	973,693,000
Total for Southwest	$3,050,457,000	$1,254,508,000	$4,304,965,000

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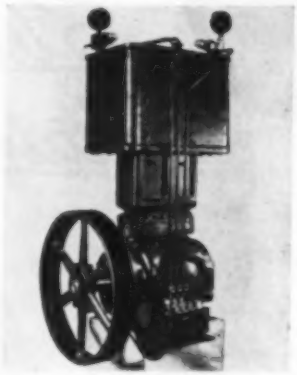
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Established 1864

La., plant of Mathieson Chemical Co.; the El Dorado, Ark., plant of Lion Oil Co.; and the Hurricane Creek, Ark., and Jones Mill, Ark., plants of Reynolds Metals Co.

When present construction is completed other plants will be added to this list: the $45 million Deer Park plant of Ethyl Corp.; the $38 million Texas City plant of Monsanto Chemical Co.; the $115 million Rockdale, Tex., plant, the $15 million Port Lavaca, Tex., plant and the Bauxite, Ark., plant of Aluminum Co. of America; the $80 million Corpus Christi plant of Reynolds Metals Co.; the New Orleans and Baton Rouge plants of Kaiser Aluminum & Chemical Co.; and Corpus Christi plant of Columbia-Southern Chemical Corp.

For the most part, the new plants and the expansions of existing plants are for the production of such petrochemicals as ethylene, toluene and benzene, and for chlorine and caustic soda, ammonia, tetraethyl lead, carbon black, vinyl resins, alumina and aluminum.

Fantastic Growth: Chemical industry got its real start in the Southwest in 1932, when Southern Alkali Corp. (now Columbia-Southern Chemical Corp.) decided on an alkali plant at Corpus Christi. That started the stampede. The entire chemical industry had been watching the Southwest, but each company hesitated to be the first to make the break. This plant was quickly followed by others.

During World War II expansion came like an explosion. Then between 1945 and 1949 a postwar growth took place. After a quiet spell in 1949, the building program of the chemical industry got under way again as the defense program began to steamroller.

Gulf Coast: Of all the chemical plants built in the United States since national defense preparation began, three-fourths are in the Texas Gulf Coast area, and the major expansion began during the postwar period.

Texas was in tenth place among the states in chemical industries in 1940. By 1944, it had risen to sixth. By now, it is crowding closer to the top.

The great bulk of the chemical industry lies along the Gulf Coast in a 100-mi. deep belt arcing from Lake Charles, La., to Brownsville, Tex., and known as the Golden Bend. At present every established company is expanding its facilities and many other companies are moving into the area.

At least 106 organic chemicals, 28 inorganic chemicals, four elemental gases, five industrial fertilizer chemicals, plus carbon black, sulphur, aluminum, iron, tin, zinc and cadmium,

BRIDGEPORT BRASS COMPANY
CONDENSER AND HEAT EXCHANGER TUBE EDITION

COPPER ALLOY BULLETIN

"Bridgeport" BRASS CO. MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND. — IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL

PROPERTIES OF 90-10 CUPRO NICKEL As Compared to the 80-20 and 70-30 Alloys

Government restrictions for nickel often require the replacement of 80-20 and 70-30 Cupro Nickel condenser and heat exchanger tubing with 90-10 Cupro Nickel or alloys containing no nickel. Fortunately, the addition of 1 to 1.75% iron to 90-10 Cupro Nickel alloy has greatly improved its resistance to impingement corrosion and general corrosion from saline cooling waters, so that it compares favorably with 70-30 cupro containing 0.5% iron.

In answer to many requests for data regarding the physical properties of 90-10 Cupro Nickel, we have compiled a table covering the available information on the physical and mechanical properties of this alloy and 70-30 and 80-20 Cupro Nickel alloys.

Effect of Nickel Content

From a mechanical standpoint there are differences among these alloys. The higher the nickel content, the stronger and harder the alloy.

There is no appreciable difference in density or coefficient of expansion among all three. However, there is a considerable difference in thermal conductivity, with the 90-10 alloy being about 50% higher than the 70-30. The same is true for the thermal capacity. The thermal differences are not significant in affecting heat exchanger design, as recognized by those most familiar with the calculation and measurement of heat transfer rates.

There is some difference in electrical resistivity or conductivity which is significant in resistance welding techniques. Although no published data are available on the resistance and metal arc welding properties of 90-10, reports from the field indicate that this alloy yields good to excellent welds.

90-10 Cupro Nickel is being used in place of 70-30 Cupro Nickel in the manufacture of Duplex Tubing. The most popular combinations involve 3S aluminum, stainless steel and low carbon steel-lined or clad with 90-10 Cupro Nickel.

COMPARATIVE PHYSICAL AND MECHANICAL PROPERTIES OF CUPRO NICKEL ALLOYS

ANALYSIS	70-30 Nominal	70-30 Commercial Limits**	80-20 Nominal	80-20 Commercial Limits**	90-10 Nominal	90-10 Commercial Limits**
Copper	70%	66 min.	80%		90%	
Nickel	30%	29 min.–33 max.	20%	19 min.–23 max.	10%	9 min.–11 max.
Iron		0.6 max.		0.6 max.		50 min.–2.0 max.
Zinc		1.0 max.		1.0 max.		1.0 max.
Lead		0.05 max.		0.05 max.		0.05 max.
Manganese		1.0 max.		1.0 max.		1.0 max.
Tin		1.5 max.		1.0 max.		

MECHANICAL PROPERTIES	70-30 Soft	70-30 Hard	80-20 Soft	80-20 Hard	90-10 Soft	90-10 Hard
(a) Tensile Strength, 1,000 psi	55	80	49	80	45	60
(b) Yield Strength, 1,000 psi	22	70	14	75	15	55
(c) Elongation in 2 inches %	45%	5%	40%	3%	40%	8%
(d) Contraction in Area %	75%	*	*	*	*	*
Rockwell Hardness, F scale	*	*	F 71	F 107	F 65	*
(e) Rockwell Hardness, B scale	B 35	B 84	B 25	B 81	*	B 75
(f) Elastic Limit psi	14-18	64-69	11-17	64-78	*	*
(g) Modulus of Elasticity in Tension, psi	22,000,000		20,000,000		*	

PHYSICAL CONSTANTS			
Density at 68°F, lbs./cu. in.	0.323	0.323	0.323
Specific Gravity	8.94	8.94	8.94
Melting Point °F, Liquidus	2260°F (1240°C)	2190°F (1200°C)	2090°F (1145°C)
Solidus	2140°F (1170°C)	*	*

THERMAL			
(a) Coefficient of Thermal Expansion per °F from 68°F to 572°F	9.0 x 10^{-6}	9.1 x 10^{-6}	9.3 x 10^{-6}
per °C from 20° to 300°C	16.2 x 10^{-6}	16.4 x 10^{-6}	16.7 x 10^{-6}
(b) Thermal conductivity at 68°F Btu/sq. ft./ft./hr./°F	17	21	26
Calories/cm^2/cm/sec/°C @ 20°C	0.07	0.09	0.11
(c) Thermal capacity (spec. heat) @ 68°F	0.09 Btu./lb./°F	*	*
@ 20°C	0.09 cal./gm/°C	*	*

ELECTRICAL			
(a) Resistivity, ohms/mil foot @ 68°F (annealed)	225	160	113
(b) Conductivity, % I.A.C.S. @ 68°F (annealed)	4.6%	6.5%	9.2%
(annealed) megmho-cm^3 @ 20°C	0.027	0.038	0.053
(c) Resistivity, microhm centimeters @ 20°C (annealed)	37	27	19
Color	White Silver	Dull White Silver	Pink Silver

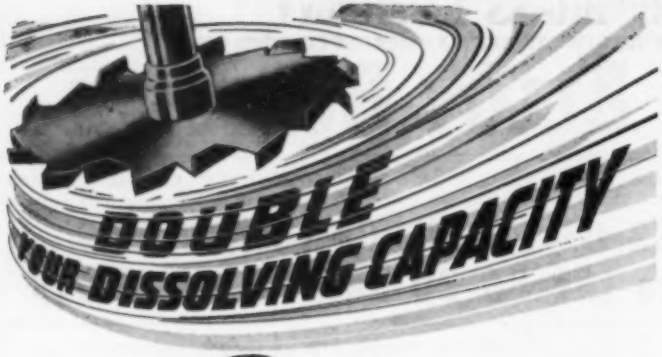
FABRICATION PROPERTIES			
Cold working	Good	Good	Good
Hot working	Good	Good	Good
Hot working Temp. °C	925-1050°C	900-1010°C	850- 950°C
Hot working Temp. °F	1700-1900°F	1650-1850°F	1550-1750°F
Machinability rating (d)	20	20	20
Soft soldering	Excellent	Excellent	Excellent
Silver soldering	Excellent	Excellent	Excellent
Oxyacetylene welding	Good	Good	*
Carbon arc welding	Fair	Poor	*
Resistance welding	Excellent	Good	*
Metal arc welding	Excellent	Good	*
Polishing	Good	Good	Good
Annealing temperature	1250-1600°F	1200-1600°F	1150-1600°F

SPECIFICATIONS—TUBE:

70-30	80-20	90-10
ASTM-B 111-50 MIL-T-15005 Amend. 4 U. S. Navy 44T 39a MIL-T-16420 (Ships) 1 July 1951 (Supersedes 44T 40a)	ASTM-B 111-50	ASTM-B 111-50 MIL-T-15005 Amend. 4

*Data incomplete. **A.S.T.M. Specifications.

(7479)



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SOUTHPORT CONNECTICUT

salt and other items are produced by the industries in the Southwest.

Light Metals: Particularly significant are the new additions in the light metals field.

Production of magnesium was started by Dow at Freeport shortly before World War II, and its output jumped from some 3,000 tons in 1939 to nearly 300,000 tons during the war. Production dropped after World War II, but now it's back to about 125,000 tons a year and growing. Dow uses a combination of raw materials—sea water, oyster shells, salt and natural gas—all plentiful in the rich Gulf Coast. Producers of aluminum, another vital metal, are moving into the area, first Alcoa and now Reynolds.

Other expansions await clearance from the National Production Authority. Recently Diamond Alkali, Eastern States Petroleum and Champion Paper & Fibre Co. got clearance on expansions totaling in the multimillions.

Like Bees to Honey: Established industries bring others. Sheffield Steel Corp. on the Houston Ship Channel was responsible for the coming of the $1 million Tenn-Tex Alloy & Chemical Corp., which will build a plant to make ferroalloys needed in steel manufacture. Sheffield's presence caused construction of a $5 million plant by A. O. Smith Corp., which makes all-welded, large-diameter steel pipe, more than 100 mi. of it a month.

Lubrizol Corp. built a plant at a cost of about $2 million to produce chemical additives, primarily for Shell. Ethyl Corp. was brought to Houston by the concentration of oil refineries.

Consumer Products: Manufacture of end products from chemical raw materials is barely getting started. Perhaps the first end product plant was Wright Manufacturing Co. of Houston, which moved there to be closer to the synthetic rubber and petroleum plastic raw materials.

At least six plants in the area are now producing insecticides, while others are making detergents and fertilizers, all using raw materials from neighboring chemical plants. These include Chipman Chemical Co. and Kolker Chemical Works, Inc., of Houston; Mathieson Chemical Corp. of Pasadena, Tex.; Dow Chemical Co. and Stauffer Chemical Co. of Freeport; and Du Pont at La Porte, Tex.

Such plants as those of Consolidated Chemical Industries, Best Fertilizers Co., Armour Fertilizer Works and Sheffield Steel Corp. of Houston, the Mathieson Chemical Corp. and Phillips Chemical Co. of Pasadena, and Kelly, Weber & Co. of Lake

Charles are turning out increasing amounts of fertilizer. Most of these plants are based on the use of ammonium sulphate and superphosphate.

These are tied in closely with the natural gas industry since anhydrous ammonia can be produced cheaply from natural gas. Sulphuric acid, of course, is produced in quantity due to the rich sulphur deposits.

The Southwest has plenty to attract these consumer product industries. In addition to natural resources, raw materials, climate and manpower, the Southwest is developing money, plant capacity and experienced workers. Market potential is growing. Better use is being made of water resources. Transportation facilities and channels for distributing goods are being improved. More research laboratories are coming to the Gulf Coast.

Golden Age: What of the future of the chemical industry in the Southwest? During the closing 50 years of the 20th century it will dominate the industrial development of that area, thinks Dr. F. A. Buechel, nationally known economist from Houston. The Gulf Coast chemical industry will produce increasingly for the national market in ever larger volume and for the world market as well. Dr. Buechel stresses three fields to watch: (1) the metal industries; (2) inorganic chemicals; and (3) organic chemicals.

Bountiful supplies of common salt, growing southern markets and continuing expansion in petroleum refining operations throughout the Southwest brought alkali and chlorine production to Texas. There continues to be a bright future for the manufacture of these inorganic chemicals.

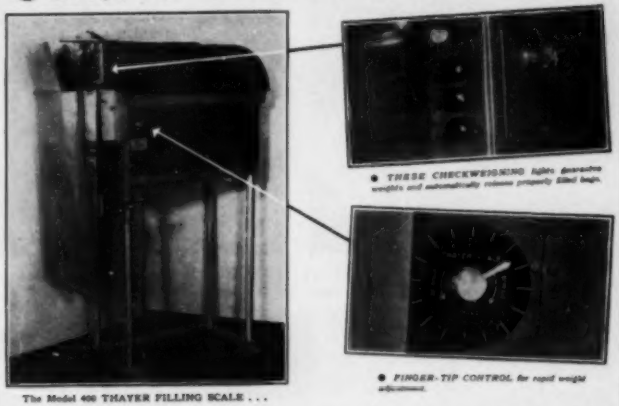
Demand for the heavy alkalis—soda ash and caustic soda—ordinarily parallels trends in the general industrial activity. On the Texas Gulf Coast, however, the rise of alkali-consuming industries may stimulate further expansion in soda ash and caustic.

The market for chlorine will continue to expand. At the same time, new uses for chlorine, especially as a chemical raw material, will require more and more of this chemical.

Present trends in the manufacture of synthetic organic chemicals indicate that the major raw materials will be acetylene, ethylene, propylene and butylenes, with butane and propane.

The industrial potentialities of the organic chemical industry in the Southwest can hardly be overestimated. The area holds the major portion of the nation's oil reserve and 77 percent of the natural gas reserves in the United States. It is predicted that chemicals produced from oil and natural gas will increase from 25 to 50 percent in the next decade.

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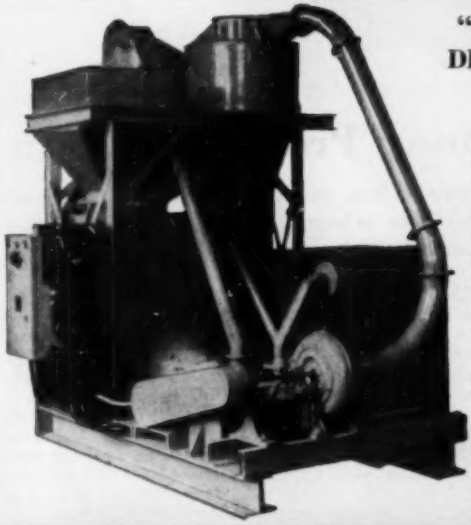
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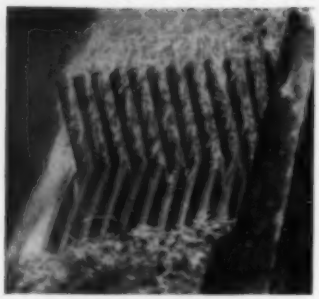
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DIFFUSION BATTERY featuring simplicity of design and continuous operation.

New Diffuser Proves Its Worth

The Oliver-Morton continuous diffuser increases yields and reduces labor in beet sugar refining. Other chemical process industries are interested.

A new and simplified continuous beet sugar diffusion battery – the Oliver-Morton – now has proved its worth in operations at the Spreckels Sugar Co. in California. With two full seasons to its credit, it has already processed over 1.5 million tons of sugar beets. Results have been far better than those anticipated when the pilot model was placed in operation close to three years ago.

The new unit is the latest development in the recent trend of the beet sugar industry toward simpler and more efficient diffusion operations.

What's equally important, the Oliver-Morton diffuser has distinct possibilities in the brewing, cane sugar refining and other chemical process industries. One major U. S. chemical firm is also interested. Its use by these industries, however, might have to wait until steel becomes easier to get.

Simple Design: The O-M continuous diffusion battery is basically simple in design. It consists of a series of up to 28 U-shaped cells (see cut), each fitted with a scroll for the greater part of its length. At the end of the scroll, and on the same shaft, are four sets of fingers (see cut) that lift and transfer the beet chips (cossettes) from one cell to the next.

Discharge end of each cell has a screen and a juice box. The juice flows by gravity through the screen and into the next cell toward the head end; the cosettes are lifted by the fingers into the next cell toward the tail end. There is a difference of about 2 in. in the level of each cell.

This design gives concurrent flow of juice and beet pulp within each cell but an over-all countercurrent flow through the battery of cells.

How It Developed: Basic idea for the new-type diffusion battery originated with W. V. Morton, then a researcher with Western Sugar Refinery. In 1947 Morton brought his original design to Philip J. McGuire, manager of the western division of Oliver United Filter Co., Oakland, Calif.

Under McGuire's direction Oliver redesigned Morton's transfer mechanism, added a few engineering refinements, and had a 12-cell pilot unit ready for testing late in the '48 sugar beet campaign.

Tested at Spreckels' Woodland, Calif., plant, all bugs were worked out in less than two weeks. Through careful design and engineering work Oliver was able to keep its development and construction costs down to a modest $50,000.

Obtaining shop-rights in the diffuser from Morton in exchange for early financial aid (Morton holds the patent with Oliver United as sole licensee), Spreckels had two batteries in operation for the '49 season: 24 cells at Woodland and 28 at its plant in Spreckels, Calif., the world's largest beet sugar factory. The O-M proved so successful that by 1953 another 28-cell unit is planned to replace three of the remaining four Roberts batch-type diffusers now in use at Spreckels.

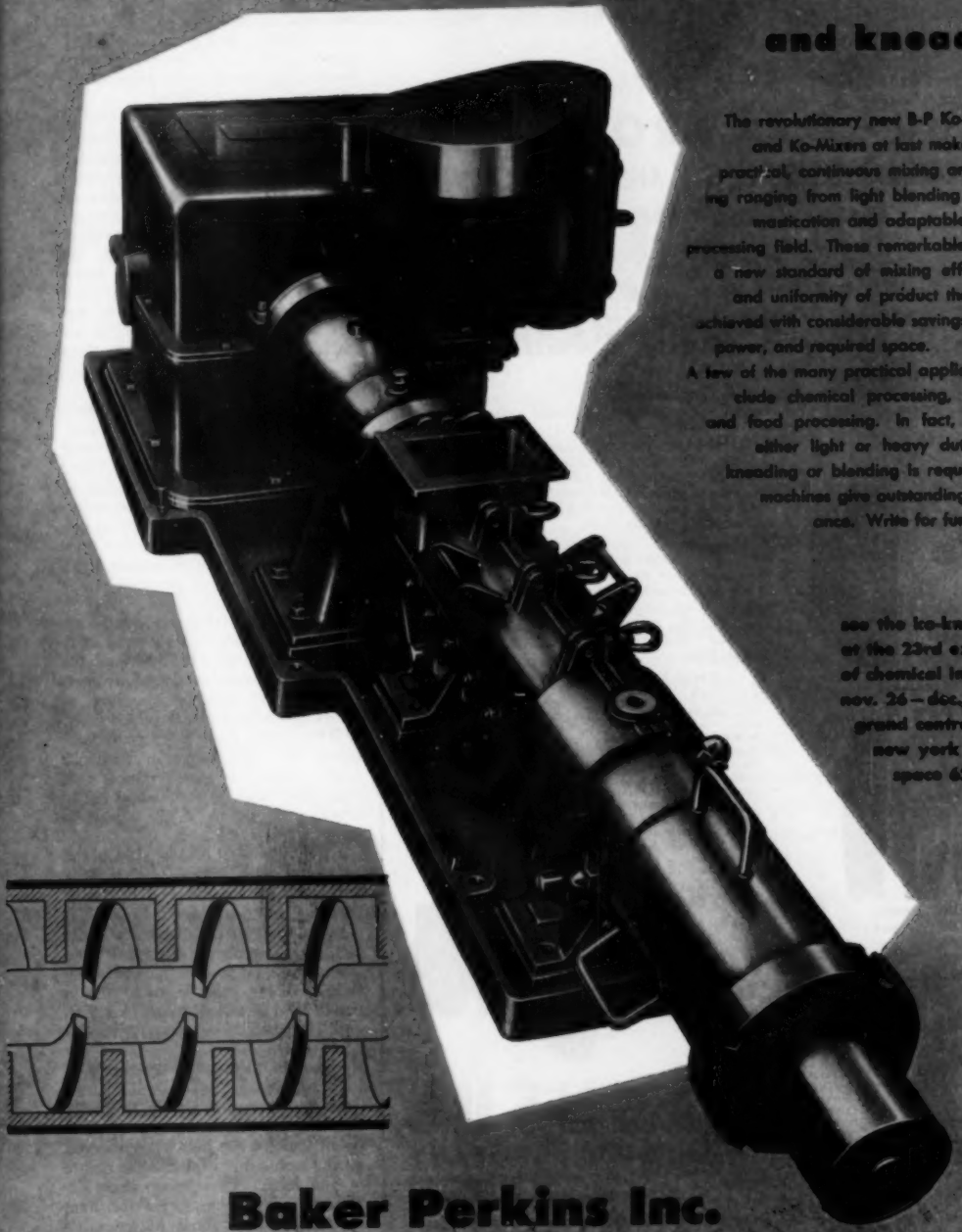
Recent Improvements: In the past 2½ years Spreckels has cooperated with Oliver United to improve several features of the O-M. Its capacity-limiting factor lies mainly in transfer of the liquid phase. Two improvements have been made in this respect: (1) increased size of liquid ducts and (2) redesigned screens separating the solid (cosette-pulp) from the liquid (water-juice) phase.

Another problem that has been solved is the cell-to-cell variations in speed of the solid phase. As diffusion progresses the cosettes become softer, occupy less volume, and exert different loads on the driving mechanism. Thus, to get maximum work efficiency from the motors, the shaft speed in each cell must be adjusted. This was done on a more or less empirical basis.

The third major improvement–a decrease in the width of the transfer mechanism from 48 to 32 in.–allows more space for diffusion within each cell. This increases capacity.

Capacity: Present nominal capacity of Spreckels' O-M unit is 3,000 tons a day. Few Roberts batteries have been built with capacities exceeding 2,600 tons. Physical limitations of loading and unloading make that figure the practical ceiling for batch type diffusers; correlation of the variable

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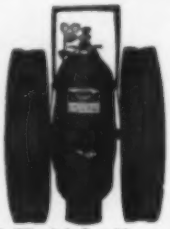
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speed drive with size of individual cells is the corresponding limitation for continuous types.

Additional cells only increase the percent of sugar recovered—not the capacity—and that only up to a certain point. Then diffusion reverses itself and sugar is lost from the juice to the pulp. Before that point is reached, however, the cost of more cells often becomes greater than the value of the additional sugar recovered.

Other Advantages: In addition to the usual advantages any continuous process has over its batch-wise counterpart, the O-M diffuser (1) increases sugar recovery, (2) reduces labor requirements, (3) lowers maintenance costs and (4) provides wide flexibility.

Under California conditions the most efficient Roberts diffuser leaves about 0.4 percent sugar in the residual pulp (based on weight of beets, not on recovered sugar). The O-M extracts all but 0.2 percent; indications are that this can be reduced to 0.1 percent.

Reducing the sugar in the pulp from 0.2 to 0.1 percent, however, eventually increases the molasses made at the expense of refined sugar. There is some difference of opinion among sugar technicians whether the reduction of raw sugar loss is actually an economic advantage. A high market price for molasses is required to make it so; precisely how high is the crux of the argument.

Five men per shift are usually required to operate the Roberts; only one is needed for the O-M—and his work can almost be classed as part-time. Only periodic checking of valves, gages and charts is necessary.

It's still too early to give any final figures on comparative maintenance costs. But it is worth noting that there have been no mechanical breakdowns or stoppages in the operating life of either O-M unit.

Flexibility of the O-M lies in the simplicity of its basic design: a wide latitude in the number of cells can be used to meet varying conditions. A good example of this flexibility is the fact that Spreckels' pilot model has been rebuilt as a French production unit. Dimensions for each cell in the linear 12-cell battery are 4 x 8 ft. The U-shaped 28-cell battery has 7 x 13 ft. cells.

▶ **Minor Problems:** Two minor problems remain to be solved. One, the control of foaming within the cells, is mainly an economic one. It exists in all steps of the beet sugar process, arising mainly from the alkaline nature of the juice. Even inexpensive defoamers become an important item when a million gallons of water are

processed through the diffuser alone every day.

Corrosion is the other problem. Certain stages in the diffusion process are more corrosive than others. In the Roberts diffuser one cell processes all stages, but in the O-M each cell is specialized and repeats somewhat the same stage over and over again, variations depending on the pH of the water and other factors.

Thus in any one battery high corrosion steps hit the same set of cells each time, speeding up deterioration of those cells' moving parts. Again, it is still too early to evaluate this effect fully.

Depending on the size and number of cells, the location, and the type of building housing the O-M, costs for a production unit will run between $300,000 and $500,000. Spreckels has found it to be a good investment.

Indiana Standard to Make Sulphur and Sulphuric Acid

Standard Oil Co. (Indiana) has started construction at its Whiting, Ind., refinery on a plant for the production of 55 tons per day of elemental sulphur. Most of the sulphur will be converted to sulphuric acid in existing plant facilities.

The new plant, which should be ready for operation next summer, will extract H_2S from byproduct fuel gases produced in the refinery and convert it into elemental sulphur of 99.9 percent purity.

CONVENTION CALENDAR

American Pharmaceutical Manufacturers Association, mid-year meeting, Waldorf-Astoria Hotel, New York, November 26-28.

23rd Exposition of Chemical Industries, Grand Central Palace, New York, November 26-December 1.

Chemical Specialties Manufacturers Association, annual meeting, Mayflower Hotel, Washington, D. C., December 2-4.

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Synthetic Organic Chemical Manufacurers Association, annual meeting, Commodore Hotel, New York, December 11.

Manufacturing Chemists' Association, semi-annual meeting, Waldorf-Astoria Hotel, New York, December 13.

American Chemical Society, Division of Industrial and Engineering Chemistry, symposium on nucleation, Northwestern University, Evanston, Ill., December 27-28.

Society of Plastics Engineers, national technical conference, Edgewater Beach Hotel, Chicago, January 16-18.



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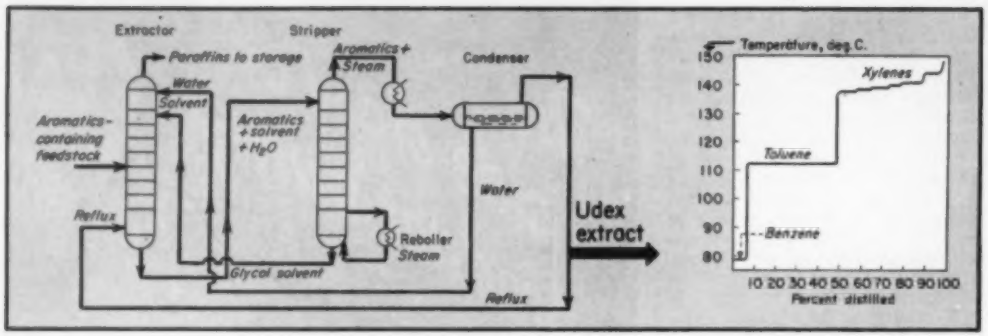
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Udex Gives Sharp Cuts

The spurt toward synthetic aromatics has led to new separation processes. Udex, latest of these, gives high yields and sharp cuts. Two new units are now going up.

Latest of the new methods to extract aromatic concentrates from reformed petroleum naphthas is the Udex solvent extraction process. It uses diethylene glycol to give sharp cuts and high recoveries of benzene, toluene and xylenes.

Although the process has just recently been revealed by Dow Chemical Co. and Universal Oil Products Co.—joint developer of Udex—two new commercial units are already going up. More can be expected soon. Universal Oil Products, Chicago, will act as licensing agent to the petroleum and petrochemical industries.

First Two Units: Roosevelt Oil & Refining Co. is putting up a Udex unit—to be completed next summer—at its Mt. Pleasant, Mich., refinery. It will have a charge capacity of 1,100 bbl. per day.

Roosevelt's feedstock will be the liquid fraction formed as a byproduct when gas oil is thermally cracked to produce ethylene. Thus the first use of the Udex solvent extraction process will be to open up what is virtually a new source of benzene and other aromatic hydrocarbons.

Actually, this liquid feed for Roosevelt's Udex unit will come from the nearby gas oil cracking plant of Dow at Midland. Recovered benzene will then be returned to Dow for processing into phenol, aniline and other benzene-derived chemicals. Roosevelt will also recover aromatics from its new Platforming unit.

The second Udex unit for separating aromatics is now going up at the Big Spring, Texas, refinery of Cosden Petroleum Corp. It will have a charge capacity of 1,500 bbl. per day and will use feed from a UOP Platforming unit (*Chem. Eng.*, Oct. 1951 p. 232).

Cosden's unit is expected to go on stream by late next summer. By the end of the year the Big Spring refinery should be recovering benzene at the rate of 1.5 million gallons a year. UOP is doing the design and engineering of the Udex unit. Construction is being handled by Procon, Inc., Chicago.

Dow's Part: The Udex diethylene glycol extraction technique is an outgrowth of research and engineering work by Dow to improve its chlorobenzene process.

In this process, unreacted benzene is separated from the chlorobenzene and then recycled. But eventually impurities build up to the point that they interfere with the reaction.

After considerable work, Dow developed a method of using diethylene glycol to clean up the recycled benzene. When the benzene shortage became acute, Dow adapted the process to recover aromatic hydrocarbons. Universal Oil Products cooperated with Dow in developing what is now known as the Udex process.

Feedstocks: One feature of the Udex process is the flexibility in the feedstocks that can be used. Recovery of aromatics from wide-boiling petroleum naphthas is exceptionally high; in addition, the Udex product can be separated by distillation to produce high-quality benzene and toluene.

Used with catalytic reforming processes, Udex extracts the maximum quantities of aromatics from reformed naphthas. It is particularly effective when used on Platformate; most Udex units will probably be operated with Platformers (*Chem. Eng.*, Oct. 1950, p. 172).

But reformer feedstocks aren't the only ones that can be used. Any mixture of aromatic and paraffinic hydrocarbons can be handled. Even straight runs with wide boiling ranges merely require an increased solvent feed rate to handle the greater percentage of paraffins—and of course a larger unit.

Olefins are the only fly in the ointment: they interfere with the sharpness of the aromatics separation. Roosevelt Oil & Refining Co. plans to pass its feedstock from thermocracking operations through a saturation process to rid it of olefins before it goes into the Udex unit. With a pre-treatment like this, feedstocks from shale oil or coal hydrogenation could even be used.

Solvent: Diethylene glycol was chosen as the solvent for several good reasons. It has high selectivity; aromatics are five times as soluble in it as paraffins. Miscible with water, it can be controlled by water as to operating temperatures and phase splits. Not being of aromatic origin, it causes no strain on the shortage it is meant to help cure.

Also, it is relatively non-corrosive and may be handled in carbon steel equipment. It is non-toxic and has a viscosity about like that of water at process temperatures. It doesn't emulsify with charging stocks.

Size of Udex units depends on both aromatic concentration and volume of feedstock. Wide boiling-range cuts require a greater solvent volume and larger equipment. Feed volume depends on the plant furnishing it; units may range in size from 500-10,000 bbl. per day.

How Udex Works: Feedstock enters a multi-tray, multi-feed extractor in which the diethylene glycol flows countercurrent to the aromatics-containing feed (see *cut*). Water mixed



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Here's evidence of the superior lubrication that a midwest milk processing plant is getting through the use of STANOLITH Grease No. 42. This pump arbor and its anti-friction bearings have been run for a year under conditions of extreme dampness . . . yet there is no appreciable wear, no corrosion.

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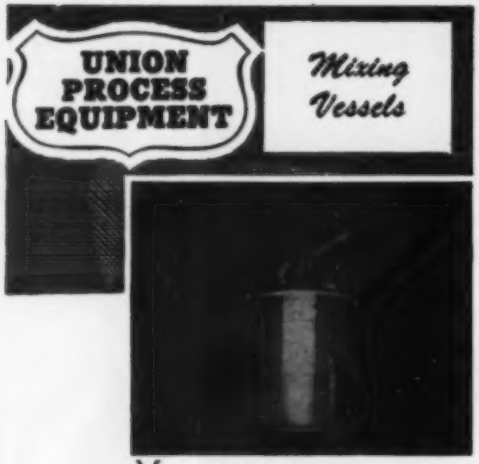
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with the glycol controls its solubility characteristics: it reduces solvency but allows good selectivity. Solubility reduction, of course, calls for a high solvent-to-feed stock ratio.

Aromatics are extracted from the feedstock by the glycol and carried to the lower part of the extractor. Here, recycle aromatics from the condenser force any paraffinic carryover out of the glycol and set up a two-phase system.

Entering the stripper, the mixture of aromatics, glycol and water is separated. This separation effectively amounts to a steam distillation of the aromatics. These are lower boiling than the glycol and are carried overhead by reboiler steam.

Using a solvent with a boiling point higher than the aromatics results in a much lower heat load. Since the solvent requires no heat of vaporization, there is a considerable savings in Btu's. Water controls the vapor pressure in a stripper and allows almost isothermal operation; there is little difference in the extractor and stripper temperatures.

The water also cuts down the tendency of the glycol to vaporize and go overhead with the aromatics and keeps temperatures below 350 deg. F. —the point at which glycol would start to decompose.

The aromatics pass overhead to a condenser where a two-phase system is set up. Glycols that reach this point are preferentially soluble in water and are drawn off with it for recycling to the extractor where they again begin removing aromatics.

Aromatics are taken from the condenser and sent to fractionating columns which give sharp separations (see cut) into benzene, toluene and xylenes that meet all ASTM specifications.

Udex gives better than 99 percent recovery on benzene, 96 percent on toluene and 91 percent on xylenes. The yield ratio is not the same as the feedstock ratio because the recovery drops as the number of carbon atoms increases.

While the process works best in the C_6-C_8 range, it probably could be adapted to recovery of higher boiling aromatics. Main drawback is the decreasing solubility of aromatics in diethylene glycol as the number of their carbon atoms goes up.

Preliminary estimates indicate that a unit designed for benzene and toluene recovery will produce them at a cost of 3.5c. per gal. of aromatics. This includes labor and supervision, utilities and maintenance, insurance, glycol cost, royalties and 10 percent depreciation.



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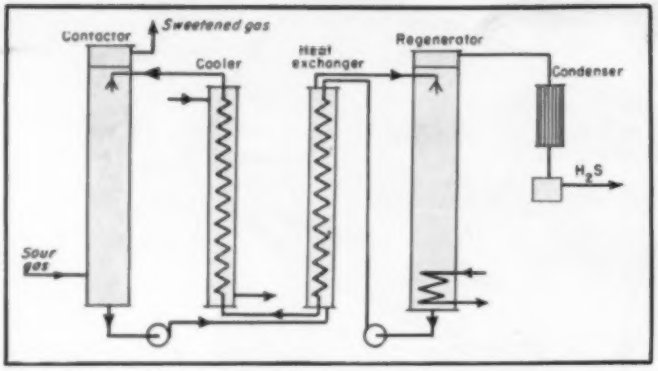
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German Process May Sell Here

Alkacid process—developed in Germany before the last war for the removal of hydrogen sulphide from sour gas, and since then improved—may find a market in the U. S.

Ten years ago practically no sulphur was made from sour gas. The situation has changed. Now close to 2 percent of the total U. S. sulphur output comes from gas recovery systems. This figure is steadily increasing as new plants come in and better processes are worked out.

One of the processes that may soon be used in this country is the Alkacid method of Bamag-Meguin, Berlin. The Alkacid process has proved a highly practical method for removing hydrogen sulphide in either high or low concentrations of sour gas.

Companies in Oklahoma, Pennsylvania and New York are now taking a look at Bamag's improved process. So states General Industrial Development Corp., N. Y., Bamag's exclusive representative in this country.

No plants in this country have ever used the Alkacid process, but it has been widely used outside the U. S. In Germany more than 35 plants—built in high pressure hydrogenation works, Fischer-Tropsch plants and lignite distillation plants—were erected since 1935. Similar installations were built in Iran, France and Sweden. The latest plant, completed this year, went up in Sweden. Bamag may soon sell to the Turkish government and Israel.

Improved Process: Big selling points are the new improvements. Since its development 25 years ago, there has been no basic change in the process, but there has been a steadily increased efficiency. Corrosion no longer is a problem. "By the use of light metal alloys," Heinrich Bommer—a director of BASF, Ludwigshafen, developers of the process—explains, "we have completely eliminated corrosion." Steam economy and the absorbing system, he also says, have been improved. Increased efficiency has meant a cut in losses, higher yields.

These improvements are the result of long experience and continued development. Many of them have come out of the pilot plant work done since the war. Developers of the process are Badische Anilin-Und-Soda Fabrik (BASF) in Ludwigshafen, the largest plant and research institution of the former I. G. Farbenindustrie.

How It Works: In the Alkacid process, which is similar to conventional American processes, sour gas enters the base of the contactor or absorber (see cut). Gas flows up the tower countercurrent to the absorbing solution. The sweetened gas passes out the top of the tower. Hydrogen sulphide bearing solution passes out the bottom of the tower, through a heat exchanger and to the regenerator. Here the down-flowing solution is heated and stripped of hydrogen sulphide by ascending steam.

Hydrogen sulphide and steam from the top of the regenerator tower pass into a cooler where the steam is condensed. The hydrogen sulphide is separated from the condensate; it is then ready for the conversion into sulphur.

Stripped solution from the base of the regenerator is recycled through the heat exchanger, further cooled, and returned to the contactor.

Two types of absorbents are used in the process: (1) "M" solution for washing out carbon dioxide and hydrogen sulphide in sour gas at the same rate; and (2) "DIK" for the selective absorption of hydrogen sulphide alone. DIK, the potassium salt of diethyl or sometimes dimethyl glycine, has an absorbing capacity of 1 volume of solution for 20 volumes of hydrogen sulphide absorbed, under the following conditions: pressure at 1 atm., and the content of the hydrogen sulphide in the sour gas at 5 percent. DIK is capable of recovering as much as 99.9 percent of the hydrogen sulphide under these conditions.

Steam consumption, Bamag claims, is also highly efficient. The process requires 20 lb. of steam per lb. of hydrogen sulphide recovered when 0.25 vol. percent of H_2S is reduced to 0.007 percent; 9 lb. of steam per lb. of H_2S to cut 2 percent down to 0.05 percent. In higher concentration of hydrogen sulphide the steam requirements figure about 4 lb.

Cooling water requirements run parallel to consumption of steam. They are, for the above figures, 132 and 26 gal. respectively.

The improved Alkacid process has another feature: it loses very little absorbent because DIK has a low vapor pressure.

DIK, however, is more expensive than conventional tertiary amine absorbents. How does the Alkacid process compare with American processes? The answer may well depend on the relative costs of absorbents.

Paper Mill Company Solves Waste Disposal Problem

A step toward solving the problem of disposal of paper mill waste has been taken by the Crown-Willamette Division of Crown Zellerbach Corp.

Orgeon State Sanitary Authority has ordered paper mills to stop dumping polluting agents into the Willamette River. In an effort to eliminate one source of stream pollution, and to comply with the order, the company is building a 19-acre settling basin adjacent to its West Linn, Ore., plant.

Into this basin, the company plans to pump sulphite waste liquor from the mill during low water periods. Waste liquor will be held there until the river level is high enough that the waste will not lower the oxygen content to the point of harming fish

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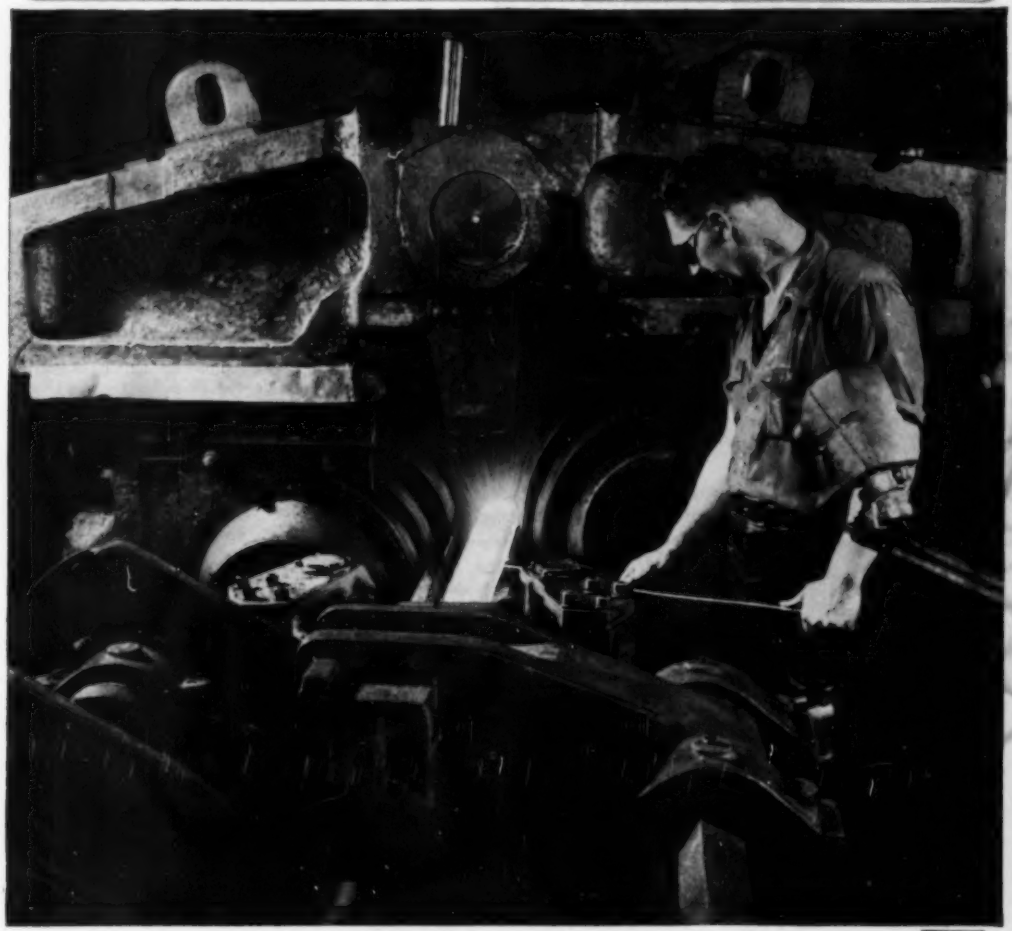
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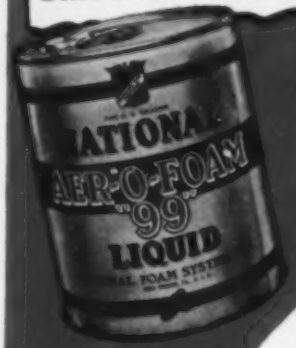
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life. Tests by Oregon State College and the state sanitary authority show that no pollution results when the river runs at flood.

The settling basin will have a capacity of 88 million gallons of spent liquor from the paper mill, which produces an average of 200 tons of sulphite pulp daily. This storage capacity will handle the entire waste liquor and "strong wash water" output of the big plant for a period of 220 days, according to engineers' estimates.

Plans do not call for lining the basin with impervious material to prevent saturation of the waste by the soil, as absorption would be beneficial to the project. Engineers report that saturation of the soil will not damage adjacent property because of the terrain.

Since the 19-acre basin runs from 18 ft. at its deepest point to only 1 ft. at its lowest, considerable evaporation is expected, which will be all to the good.

Price of Terramycin Drops As Pfizer Expands Output

Price of terramycin, Chas. Pfizer & Co., Inc.—producers of natural fermented terramycin—has announced, has been cut 15 percent on oral capsules, 40 percent on the intravenous form. The new cut makes the total price reduction of terramycin, which was introduced to the market 18 months ago, about 40 percent.

New production facilities, important research and process improvements, and world-wide demand made the price reduction possible. A long-range expansion program, to be completed in 1952, has steadily increased Pfizer's antibiotic production. The program, which will cost in excess of $15 million, has already doubled the company's antibiotic fermentation capacity.

Goodrich Will Again Modify Its Texas Rubber Plant

B. F. Goodrich Chemical Co.'s synthetic rubber plant at Port Neches, Tex., is in for further modification. The fourth unit will be converted to oil-extended cold rubber. Completion is expected in March. The oil will come from the nearby Sun Oil Co.'s refinery.

Half the Goodrich plant was converted to cold rubber production in August 1949, and the third unit in April 1951. Original rated capacity of the plant was 60,000 long tons a

year, but production has considerably exceeded this figure. After completion of the fourth unit, the plant will produce 7,500 long tons per month.

Sun Oil to Spend $40 Million On 2-Year Refinery Program

A two-year construction and refinery modernization program will cost Sun Oil Co. around $40 million. This year Sun will spend $13.8 of the $40 million. The program will increase the company's total refining capacity between 35,000 and 40,000 bbl. a day. It will increase its output of military aviation gasoline; and permit large volume production of benzene and other materials in critically short supply.

Largest single item in the program is a 10,000 to 15,000 bbl. per day refinery, to be built at Sarnia, Ontario, Canada. It will cost about $10 million. The construction, expected to get started next spring, will include a Houdriflow catalytic cracker.

At Sun's Marcus Hook, Pa., refinery a new Arosorb process for the purification of aromatics is under design. The installation will produce annually more than 13 million gallons of benzene, 30 million gallons of toluene and 15 million gallons of aromatic aviation gasoline blending stock for the production of high-grade aviation fuel.

A Houdriformer, designed for the catalytic reforming of low-octane petroleum naphthas, is also being built there to provide feedstock for the Arosorb unit. It will have a charging capacity of 13,000 bbl. a day of naptha.

Lubricating oil plant with a capacity of 250,000 bbl. a month of finished high-grade lubricants is also under construction at Marcus Hook.

Propylene polymerization plant to make high-quality gasoline from propylene recovered from refinery gases will also be built there. Currently propylene is partially recovered with propane for liquefied petroleum gases, or burned as fuel. The plant will have a charging capacity of 6,000 bbl. per day.

Large ammonia refrigeration unit, to be operated as part of the alkylation plant, is now under construction at Marcus Hook.

A sulphonates and naphthenic acid plant are other scheduled projects. In addition, improvements will be made on existing lubricating oil, catalytic cracking and tetraethyl lead blending units.

Catalytic naphtha reformer for the production of 10,000 bbl. per day of straight-run gasoline will be the prin-

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ciple project at Sun's refinery in Toledo, Ohio.

Propylene polymerization plant, similar to the type under construction at the Marcus Hook refinery, is another construction project. This plant will have a charging capacity of 4,000 bbl. per day.

New Evaporator To Be Tried On Spent Sulphite Liquor

Expanded research on evaporating spent sulphite liquor either for burning or for other uses will begin at the pilot plant of the Sulphite Pulp Manufacturers' Research League, Appleton, Wis. Studies will be made on a second experimental evaporator that has just been installed.

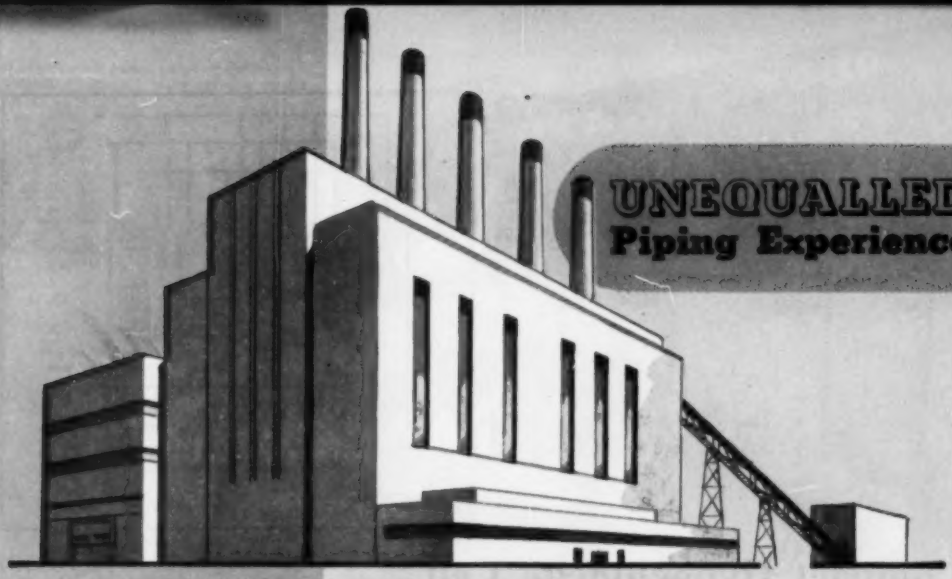
The only evaporator in Wisconsin capable of concentrating spent sulphite liquor for burning is a two-year-old Swedish-made reverse-flow unit now in the League's pilot plant. This unit, which has been operating at capacity since it was installed, is responsible for all progress to date.

The new evaporator is of a type that has been successfully used in many chemical industries. It started operation this month. Before now it was never extensively tested on sulphite liquors. Experiments on laboratory-scale equipment were encouraging, and led the league to the decision of installing this unit.

"The principal problem is concerned with removing water from spent sulphite liquor by evaporation. But lime salts in the liquor tend to crystallize in deposits on the hot surface of the evaporator and thereby put the evaporator out of commission," explains Averill J. Wiley, league technical director.

"This new evaporator operates on the principle that the lime salts would rather crystallize out on small particles of the same lime material than on the evaporator wall. It accordingly provides a bed of lime salts to attract the crystallization away from the evaporator surfaces. If this proves successful with spent sulphite liquor, it will permit using an evaporator of simpler design than any equipment previously developed for the purpose.

"We hope, of course, that experience will substantiate the manufacturer's claims of low operating costs and high efficiency. This could be an important step toward solving the total problem of sulphite pollution. Whether or not any given method for reducing stream pollution can be adopted by the mills must depend upon whether it can be used at a cost that is economically supportable."



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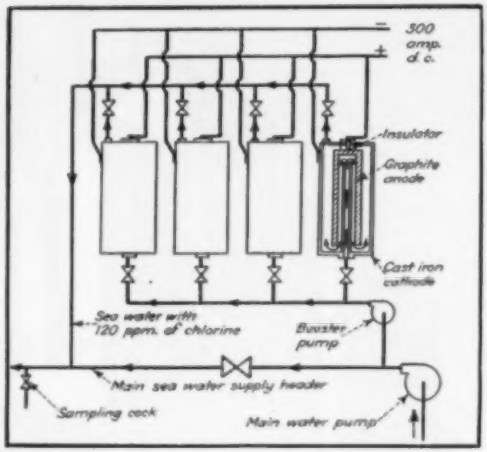
4 Plants Are Better Than 1

PIPING FABRICATORS AND CONTRACTORS

*Including Projects Now Under Construction or on Contract

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Compact Hypochlorite Cell

Sea water becomes cheap source of chlorinated water when Negus cell is employed. Fisheries and other industrial plants can use it to cut sanitation costs.

Fast and efficient means for generating sodium hypochlorite solution from sea water is the Negus cell. This novel electrolytic cell works equally well on strong brine solutions made up from fresh water and salt. Sea water or a brine solution is treated in transit under pressure, with or without filtration, by passing all or some of the liquid through the cell, thus producing the chlorine necessary for complete sterilization, as well as the required amount of residual chlorine.

The cell was designed by Frank Negus of Halifax, Nova Scotia. Water Processing & Chemical Co., Ltd., also of Halifax, builds the cells for in-plant chlorination in Canadian fisheries. Installation in the U. S. is being handled by Standard Laboratories of Boston.

Use of the cells is fast catching on with Down East fisheries. Mariner Fish Co. of Gloucester, Mass., for example, employs four Negus cells to generate chlorine in harbor water. The resulting sodium hypochlorite solution is used to wash incoming fish and to flume fish scrap from the cutting tables; it's also used for washing floors, walls and equipment.

At the Mariner plant, about 400 gpm. of sea water is pumped into a 4-in. feed pipe, from which 50 gpm. of harbor water is bypassed, passes through a booster pump and enters the four chlorine-generating Negus cells. In the cells, salt in the water is broken into chlorine and caustic soda; sodium hypochlorite solution results. About 120 ppm. of chlorine is contained in the water. The chlorinated water is returned to the main line, where the chlorine content is diluted to 15 ppm. From this point, the treated water is ready to do its sterilizing job.

Each cell requires 9.75 v. and 75 amp. to operate. Therefore, the entire Mariner installation uses about 3,000 w., and the power cost at 2 c. per kwh. is 6 c. per hr. A rectifier furnishes d.c. current to the four electrolytic cells.

Cyril C. Sullivan of Standard Laboratories gives these performance data for a typical Negus cell installation:. "At 4.2 v. and 50 amp. d.c. we get a constant 12 ppm. as residual chlorine at a flow rate of 10 gpm., using sea water of 3 percent salinity. At 3.8 v. and 300 amp. we get a constant 150 ppm. as residual at a flow rate of 25 gpm. with sea water. The same results obtain when we use a fresh water brine of equal salinity. By using a more concentrated salt brine, as represented by 0.5 lb. of salt per gallon of fresh water, and recirculating through the cell we get a bleach of 1 percent residual chlorine. We use 25 gal. of brine, recirculate at the rate of 8 gpm., and get a non-caustic bleach of 1 percent in 20 min."

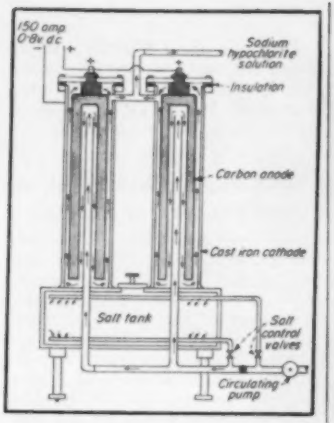
The Negus cell consists of a vertical cylindrical case made of cast iron, with a cast iron pipe passing up through it, and an elongated inverted graphite cup electrode over the pipe. The cell case and the pipe within it act as negative electrode; the graphite cup, which is insulated through the removable bolted cover of the cell casing, is the anode.

Ordinary sea water (about 3 percent salt solution) enters the cell through a valve and passes up through the negative electrode pipe, cascades down around this electrode and against the inside of the graphite cup positive electrode, then rises in the annular space between the outside of the positive electrode and the inside of the negative cell casing, passes into the sodium hypochlorite outlet and thence into the main stream of sea water, where sterilization is effected.

Forcing sea water under pressure through the cell causes very rapid mixing while the brine is in transit. This rapid mixing brings the chlorine and the sodium hydroxide generated in the cell into contact so they can react, thereby producing sodium hypochlorite in the required concentration. The reaction of the chlorine in the solution creates a slightly acidic condition, which means rapid destruction of bacteria, for a solution containing 1 gram-mole of hypochlorite contains 70 g. of active chlorine.

If a higher concentrate is sought from sea water or if the cell is to be used on fresh water, the cell is equipped with a salt feed pot. This is filled with coarse salt and water is forced through. The resulting strong brine passes through a salt feed valve into the cell, where it yields more chlorine.

On large flow rates of sea water or fresh water, the process utilizes a tank that acts as salt feeder and filter.



The filter tank has a removable cover; when salt is added and the cover replaced, the system works under pressure. Water enters through the main feed line, which is equipped with an orifice that causes some of the water to pass through a check valve and through the inlet valve into the salt tank. Water then passes through the salt bed, filter medium and strainer system into the brine inlet pipe, thence through the cell and, via an orifice, into the main flow, where sterilization occurs.

Sodium hypochlorite yield is controlled by amperage, brine density and electrode spacing, and can be automatically proportioned into the water system. A complete control of chlorine residual can be achieved without the use of a proportioner.

A monomolecular layer of hydrogen, constantly being formed on the inside of the negative pipe and casing, protects them from corrosion.

The Negus cell can also be used together with a brine purifier that provides rapid flocculation and filtration. Thus the brine is clarified, sterilized, brought to the requisite chlorine residual, and has its density automatically maintained. Big advantage is that the brine can be used over and over. With other methods now in use, brine must be dumped every few hours due to high contamination.

Since it's compact and portable, the cell can be used wherever an electric outlet and a water supply are available. According to Sullivan of Standard Laboratories, a packaged unit is now being constructed in Boston. It will be 24 in. square and 7 ft. high, with a 150-amp. rectifier mounted over two inclosed cells in an angle iron frame. The packaged unit will be all ready to plug in to 115-v. 60-cycle a.c. current and to pipe up to 1-in. or 3/4-in. unions. (Continued)

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(3) Double check the inspection procedures of your fabricator. Knowing that the properties of the alloy can be impaired during fabrication, we have established rigid shop procedures and inspection methods as an extra guarantee of soundly built vessels.

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Price runs about $400 for a single Negus cell, and $550 for the double cell. For d.c. current, only a rheostat is required; but for a.c. operation, a rectifier must also be purchased.

Karl Compton Will Speak at Award Dinner For Phillips

Karl Compton, chairman of Massachusetts Institute of Technology, and one of the three men who helped establish the nation's synthetic rubber program, will be the principal speaker at the 1951 Chemical Engineering Achievement Award dinner.

The dinner, which will honor Phillips Petroleum Co. for its work in developing carbon black and contributing to the success of cold rubber, will be held at the Waldorf-Astoria Hotel in New York on November 28. Alfred H. White, professor emeritus of chemical engineering at the University of Michigan and chairman of the award committee, will make the formal presentation of the award.

When notified of winning the award, which is given biennially by *Chemical Engineering*, K. S. Adams, chairman of Phillips, said, "We are gratified and highly honored by our selection as the winner of the 1951 award for chemical engineering achievement. We sincerely thank the committee for the consideration given our accomplishments and hope we can continue to help advance the profession of chemical engineering."

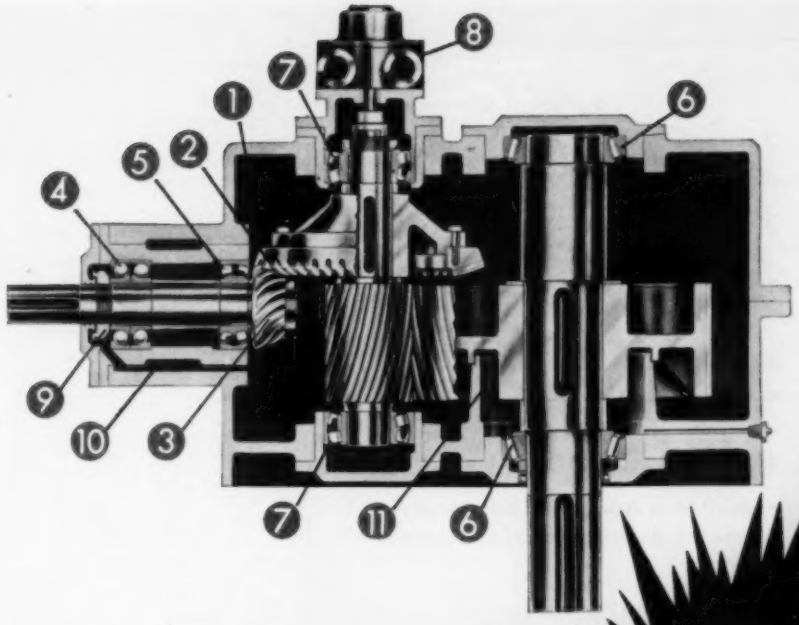
Phillips through its developments in carbon black and cold rubber helped the balance from natural to synthetic rubber for tire treads, thus making the U. S. more nearly self-sufficient in rubber.

Pacific Western to Complete Carbon Dioxide Well in Utah

A carbon dioxide well in Gordon Creek, Carbon County, Utah, by Pacific Western Oil Corp., is almost completed. The well, estimated to cost a total of $1 million, could make daily from 8 million to 11 million cubic feet of CO_2.

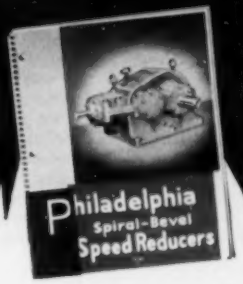
Compression and storage facilities, estimated to cost around $1 million, are being planned by the company. Gordon Creek CO_2, which is 98.8 percent pure and without hydrogen sulphide, can be easily compressed as it comes from the well-head.

Since the production of dry ice at the well will be inexpensive, the company hopes to secure a large market in California for frozen foods.



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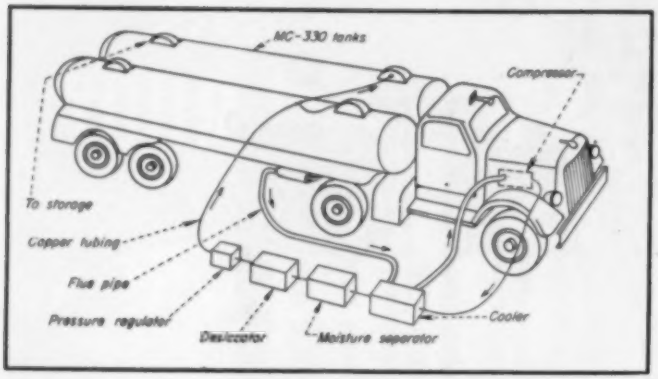


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Trucking a Bad Smell

Specially designed tank truck, the first motor vehicle to receive an ICC permit for hauling methyl mercaptan, has a unique unloading system.

New 3,000 gal. tank truck now hauls methyl mercaptan from Houston to points far and near.

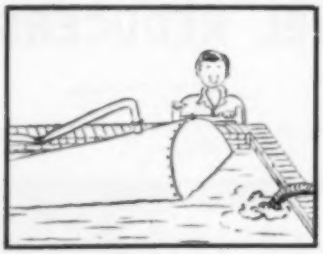
On its maiden trip, the twin-tank truck carried the disagreeable chemical from the plant of Natural Gas Odorizing Co. in Houston to a customer in Baltimore. Designed by the engineers of Universal Manufacturing Co., Houston, it is the first and only truck to get an ICC permit for hauling the gas odorizing chemical.

Equipped with an unusual unloading system, the truck uses compressed exhaust gas to force the chemical out of the trailer tanks. The method is sound and successful, and eliminates the use of pumps with their attendant leakage, or other sources of inert compressed gas.

Flow Scheme: The truck exhaust gas passes through a 4-in. pipe to a crushed-ice container; then to the 12 cu. ft. per min. engine-driven compressor. The compressed gas is sent to the cooler; then to a moisture separator where condensate is removed. For further drying it is then sent to a pressure cylinder filled with desiccant. Dry and virtually oxygen-free gas is then sent to the gas inlet on the top of the tank. Methyl mercaptan is forced from the transport to the storage tank of the customer. About 6 hr. and 1,000 lb. of crushed ice are required to do the job properly.

Cleaning the tank is easy. Purified methyl mercaptan vapor is introduced into the gas inlet of the tank. Resultant condensate washes the tank walls. The condensate then flows to the other end of the tank. It is removed and returned to the plant for recovery and reprocessing.

LITTLE BONER



It Floats!

An English chemical manufacturing firm had just about completed its new multi-million dollar plant. A large horizontal tank, to be used for storing a liquefied hydrocarbon gas at sub-zero temperatures, was being installed inside a brick-walled compound.

Design called for the tank to be embedded in loose sand—partly for thermal insulation, partly as a safety device to assist fire fighting in case of a gas leak ignited.

The construction engineer, an ingenious fellow, decided that the quickest and easiest way to get the sand in place would be to slurry it with water and pump it into the compound.

Everything went well until the job was about half done. Then suddenly the tank tore loose from its footings and bobbed up to the surface like a cork.

The engineer had forgotten that an empty tank would float!

Why not send in your true "little boner" story? Address the Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

Research Center to Be Built By Stanolind Oil in Tulsa

A new research center will be built at Tulsa, Okla., by Stanolind Oil & Gas Co., which has just been authorized to go ahead with the project by the Petroleum Administration for Defense. Construction is about to start and will take 18 months.

Composed of five buildings covering 40 acres of an 80-acre tract, the research center will be one of the most modern in the oil industry. It will be devoted almost entirely to research in petroleum exploration and production, and to processes for making synthetic fuels and chemicals.

Stanolind's research group is headed by George Roberts, Jr., and includes 425 people. Activities of the department are divided into four major groups: process research, under the direction of Scott W. Walker; exploration research, headed by Daniel Silverman; production research, under Lloyd A. E. Elkins; and patent activities, directed by Paul F. Hamley.

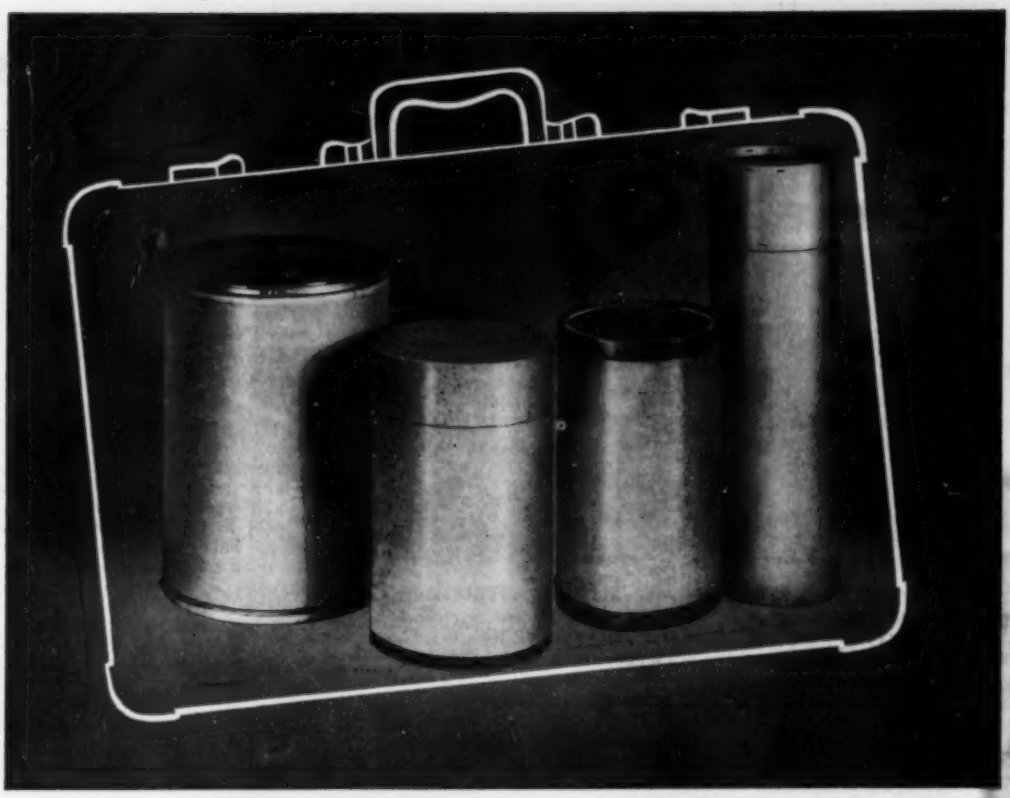
Steel Alloys Plant to Go Up On Houston Ship Channel

A new $1 million plant to produce ferromanganese, ferrosilicon and other alloys vital to the manufacture of steel will be built by the newly-formed Tenn-Tex Alloy & Chemical Corp.

Occupying a 15-acre tract of land on the Houston Ship Channel, the plant will make about 2,000 tons of refined metals a month. It will import about 5,000 tons of manganese ore a month from Cuba, India, South Africa, Mexico and South American countries. Other raw materials, including limestone, coke and steel scrap, will come from Texas.

Commercial Solvents Gets $25 Million for Expansion

New projects for which certificates of necessity have been granted Commercial Solvents Corp. amount to over $22 million. They include facilities for producing ammonia and methanol, and a new ammonium nitrate plant at Sterlington, La.; a new



HEAVY PRODUCTS TRAVEL LIGHT IN THESE CONTINENTAL DRUMS

You can't beat Continental fibre drums for shipping economy. Their light tare weight means worthwhile savings at today's high freight costs – even greater savings on export shipments to countries where import duties are levied on the gross weight.

Continental fibre drums are built to stand up under rough handling. They are rugged and durable, give extra protection to both expensive and dangerous articles for shipment across the country or across the world. Closures are tight and strong – but easy to open and easy to close.

When it comes to appearance – Continental fibre drums are trim and neat. They come in a complete line of sizes from 3/4- to 75-gallon. Attractively printed or spray painted, each Continental drum is a star traveling salesman for your company.

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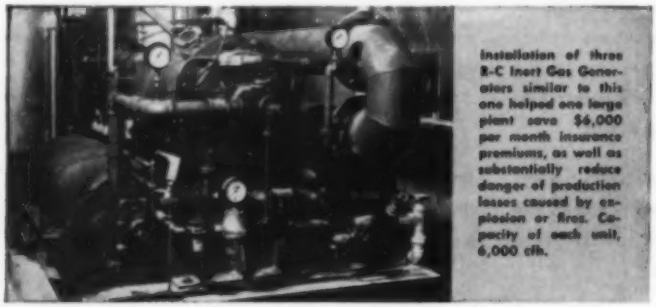
A portable R-C Inert Gas Generator used for purging operations and stand-by protection in large gas-producing plant. Capacity 15,000 cfh.

Today's urgent production demands can tolerate no unwarranted risk of interruption by explosions which might cause even small fires or other plant damage. Against such hazards, R-C Inert Gas Generators provide positive, economical protection.

This protection is essential in plants where inflammable gases, liquids, explosive dusts and other dangerous materials are handled, processed or stored. Available either in stationary or mobile units, R-C Inert Gas Generators greatly reduce the risks from fires caused by explosions. They are compact, simple and sturdy in construction and operate at extremely low cost. Available in capacities from 1,000 to 35,000 cfh.

If your operations involve materials or processes which might cause explosion-produced fires, investigate the protection afforded by R-C Inert Gas Generators. Installation costs in many cases can be offset by insurance savings. Ask us for details.

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Installation of three R-C Inert Gas Generators similar to this one helped one large plant save $6,000 per month insurance premiums, as well as substantially reduce danger of production losses caused by explosion or fires. Capacity of each unit, 6,000 cfh.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

plant at Terre Haute, Ind., to produce dextran, and additions and changes in the penicillin and bacitracin antibiotics plants. In addition, further expansions to increase the output of other chemicals, drugs, and agricultural products are under consideration.

The company will borrow $25 million from institutional lenders on 3¾ percent notes maturing Sept. 1, 1972. The proceeds will be used to finance the CSC expansion program.

Carbon Black Production Believed Adequate for 1952

At a recent meeting in Washington, representatives of the carbon black industry and NPA agreed that the total production of carbon black, except for grades SRF and thermal, will be adequate for the coming year.

NPA estimated that the production capacity by the end of the year will be 1.7 billion pounds annually. It will reach 2.2 billion pounds in 1952. Consumption, including exports, was estimated at 1.7 billion pounds in 1951 and 1.9 billion pounds in 1952.

Shipments, industry reported, are being delayed because of the shortage of hopper cars. NPA told industry officials that they most likely will get the 110 new hopper cars they requested to meet the shortage.

Industry representatives recommended that the Office of International Trade be asked to consider changing its present system of approving exports by grades. They said it would facilitate distribution if OIT would screen export requests only for security purposes and leave filling of the individual orders by grades to the industry itself.

Demand for Fluorspar May Mean New Plants

Producers of acid grade fluorspar have been urged by National Production Authority to increase the output of this critical material. It is needed to support several expansion programs, particularly aluminum.

NPA officials cited at a recent conference in Washington the imperative need for additional quantities of acid fluorspar to meet specifications required to produce strong aluminum alloys. The producers indicated a government directive may be necessary to provide the additional tonnage needed.

Industry representatives believe that new fluorspar processing plants will have to be built. This will take about eight months. In the meantime, they

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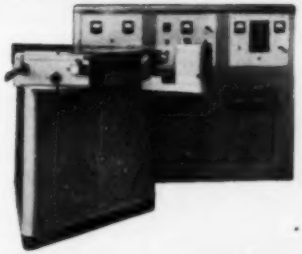
. . . the line that offers you the most complete selection and most advanced types of instruments and related equipment

Production Control Quantometer analyzes metals in two minutes



Multi-purpose, direct-reading spectrometer for quantitative analysis of inorganic samples. Instrument will give quantitative determinations of as many as 25 elements as selected by the user—up to 20 simultaneously. Designed for routine production control and research analysis. Each instrument is designed to meet your specific analytical requirements.

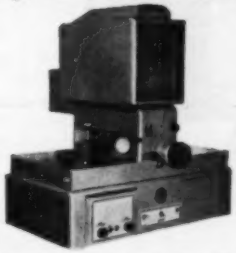
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Source units are available in types to meet all testing requirements.

Film Comparator–Densitometer–easy to identify element lines and measure their density



This instrument is manufactured to the highest ARL standards, permitting the most accurate qualitative and quantitative analyses, based upon spectrum line positions and densities. It is easy to adjust and the image is located in a non-fatiguing viewing position. As many as 6 lines per minute can be easily read.

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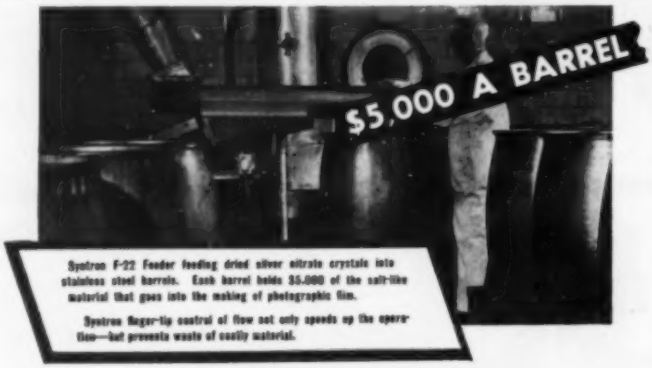


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That's right! Ansul Dry Chemical Fire Extinguishers are Water-tight. Thousands of Ansul Extinguishers stand guard over difficult fire hazards in locations where the extinguisher cannot be protected from the weather.

For installations where extinguishers cannot be pampered with expensive shelters, water-tight construction is essential for dependable fire protection. That's one reason you see so many more Ansul Dry Chemical Fire Extinguishers in outdoor locations protecting all sorts of tough hazards associated with the petroleum industry.

SEE PAGE 240



Syntron F-22 Feeder feeding dried silver nitrate crystals into stainless steel barrels. Each barrel holds $5,000 of the salt-like material that goes into the making of photographic film.

Syntron finger-tip control of flow not only speeds up the operation—but prevents waste of costly material.

SYNTRON

"Vibra-Flow"

VIBRATORY FEEDERS

With Variable Control of Rate of Flow

WILL HANDLE—most types of bulk materials—from light, fine powders to heavy, coarse lumps—hot or cold—dry or damp—abrasive. AT—variably controlled rates from pounds to hundreds of tons per hour. TO—crushers, belts, screens, ovens, blenders, packaging machines, etc. WITH—exceptionally low maintenance costs due to absence of motors, pulleys, eccentrics and other wearing parts.

SYNTRON COMPANY

610 Lexington Avenue Homer City, Penna.

said, it may be necessary to reschedule shipments to current users.

It was estimated that about 1,000 additional tons of acid grade fluorspar with a silica content of not more than 1¼ percent is needed each month for the next five or six months to meet aluminum program requirements.

Producers in some Rocky Mountain states said it will be possible for them to produce more acid grade fluorspar with present plant capacity if they can obtain the ore.

Monsanto Renews Contract To Run Two Labs for AEC

Monsanto and the Atomic Energy Commission have agreed upon a 4½-yr. renewal of the contract for Monsanto's operation of Mound Laboratory at Miamisburg, Ohio, and Scioto Laboratory at Marion, Ohio.

The new contract covers operation and maintenance of the two laboratories that are engaged in highly classified research and development work in the atomic energy field.

Monsanto has been active in atomic energy work since 1943, when it began a project at Dayton, Ohio, for the Manhattan Engineering District, Army predecessor of the AEC. For almost three years, beginning in 1945, Monsanto operated the Clinton National Laboratories at Oak Ridge, Tenn. The Mound Laboratory was built by Monsanto for the AEC and began operating in 1948, consolidating two temporary units that had been located in Dayton. Scioto Laboratory operations began the same year.

New Expansion Program For Esso at Baton Rouge

Esso Standard Oil Co. plans to spend more than $35 million for new construction at its Baton Rouge, La., refinery. The project will increase the refinery's processing capacity from 240,000 to 270,000 bbl. of crude oil daily, in addition to a major expansion of its chemical operations. Construction will begin immediately and will take about two years for completion.

Plant enlargements will include new distillation equipment for crude oil and other petroleum fractions; expansion of fluid catalytic cracking facilities; additional equipment for processing petroleum gases to provide some of the raw materials for chemicals and materials for aviation gasoline; expanded blending and shipping facilities for gasoline, kerosene and heating oil; facilities for producing



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DOWNINGTOWN also maintains a Heat Transfer Division under the direction and supervision of men thoroughly trained and experienced in this field. Our Engineering Consultation is at your service to aid you in preparation of plans and specifications for definite jobs.

Useful literature sent upon request on your business letterhead. *Remember:* "Your Needs are Our Specialty!"

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HEAT EXCHANGERS



Recently Developed

3-WAY FULL AREA, PACKLESS SOLENOID VALVES

PIPE SIZES: 1, 1¼, 1½ and 2 inches

We recommend this valve for controlling equipment where pressure must be alternately applied and exhausted as, for example, with diaphragm motor valves, air or hydraulic cylinders, etc. Classed as Bulletin 8331 ASCO Valves, here are a few specifications: maximum pressure 125 to 250 pounds; minimum pressure 10 to 20 pounds. Suitable for handling air, water, gas, oil and other non-corrosive gases or liquids up to 180°F.

Since the automatic control of any alternating application and release of pressure is so important for efficient operation, we suggest that you bring your problems to the attention of our engineers whose experience goes back nearly 40 years.

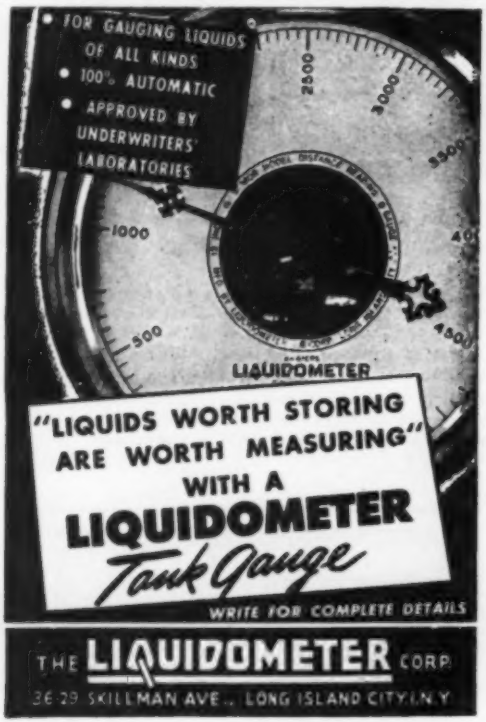
If you have recurrent and varying needs for automatic control valves, you should have our General Valve Catalog No. 23.

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When in need of Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and Specialized Electromagnetic Controls, come to us.

Automatic Switch Co.

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additional butadiene (raw material for synthetic rubber) and for increasing the refinery's output of synthetic alcohols from petroleum, and equipment for the production of benzene.

Alcohol-From-Wood Plant Ready to Go Again

Oregon Wood Chemical Co. will resume production of ethyl alcohol from wood waste. After a six-month shutdown, its Springfield, Ore., plant is ready for operation.

Some major changes were made. One was the installation of equipment to prevent air pollution by spent wood refuse blown into the air in the form of brown powder. Now a muffling device will confine the powder.

Other changes, according to Charles Hudson, president of the company, will assure continuous production. Capacity of the plant is between 10,000 and 15,000 gal. of 190-proof ethyl alcohol daily.

Glycol: Jefferson Chemical Co. has received authority from the federal government to build an ethylene glycol unit at its Port Neches, Tex., plant.

Petroleum: Pure Oil Co. will expand its Smith Bluff refinery at Nederland, Tex. The new construction will include a fluid catalytic cracking unit, catalytic polymerization unit and enlargement of alkylation facilities. Plans call for the erection of a new feed preparation unit with vacuum flash section of about 20,000 bbl. daily capacity. Charge capacity of the new catalytic cracker will exceed 26,000 bbl. daily.

Petroleum: Sunray Oil Corp. has been granted authority by DPA to build a $10 million catalytic cracking refinery at Corpus Christi. It will have a 25,000 bbl. daily crude capacity. Aviation gasoline will be produced with a minimum of fuel oils. Products for the petrochemical industry and high octane motor gasoline will also be produced. The plant site, purchased from Southern Minerals Corp. of Corpus Christi, will be a 140-acre tract near Viola, Tex., on the Neches River, 6 mi. northwest of the city limits.

Hydrogen peroxide: The Buffalo Electro-Chemical Co. plans to start operation of its $4.3 million plant at Vancouver, Wash., on Jan. 1, 1952. By September of that year full-scale production of hydrogen peroxide should be under way.

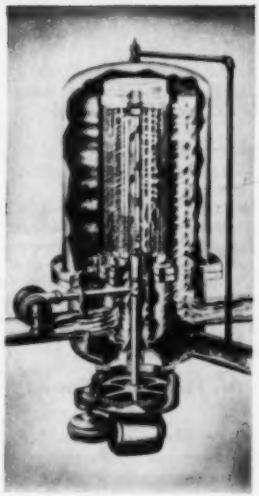
—*End*



Clean Raw Water
Reclaim Process Water

with this low-cost non-stop strainer

Abrasion and corrosion-resistant Cuno FLO-KLEAN handles full flow—cleans itself and discharges accumulated trash *without interrupting* flow. Can be installed in some remote place and forgotten. Some users have saved enough to pay cost of FLO-KLEAN in a few months!



CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Kinds of Fluids

Strain fuels, lubricants, process fluids, etc.—AUTO-KLEAN
Filter fuels, lubricants, process fluids, etc.—MICRO-KLEAN
Clean raw water, recirculating water, etc.—FLO-KLEAN

Aid for "Dry" Communities ... Relief from High Water Bills

Many industrial plants have solved the scarce-water problem by using raw river or lake water for plant services.

Passing such water through a Cuno FLO-KLEAN effectively strains out trash and cleans the water at rates up to 20,000 gpm, with negligible pressure drop.

Other plants use FLO-KLEAN for reclaiming used process water. Even when water isn't scarce, it still costs money, particularly if it has been heated for process work.

On this basis, Cuno FLO-KLEANS have paid for themselves in as short a time as six months.

They even reclaim their own backwash water—not wasting a drop!

Continuously Cleanable Permanent

The Cuno FLO-KLEAN positively removes all solids larger than specified. May be specified from .030 in. down to .0025 in. Operation is continuous—because the strainer is continuously self-cleaning. Therefore, full flow can be handled without needing a duplex installation.

With continuous backwash cleaning of the cartridge and automatic top and bottom blow-down, the FLO-KLEAN needs no attention.

All-metal construction is abrasive and corrosion-resistant.

Cuno Engineering Corporation
Dept. 101E, South Vine Street, Meriden, Conn.

Please send information on Cuno FLO-KLEAN for straining raw water....reclaiming process water....

Name.....Title.....

Company.....

Address.....

City.....Zone....State....

Please attach to business letterhead

Readers' Views & Comments



Help the Poor Prisoner . . .

Sir:

A person who knows you and who has spoken very highly about you, has made me trust you a very delicate matter of which depends the entire future of my dear daughter, as well as my very existence. I am in prison sentenced for bankruptcy, and I wish to know if you are willing to help me to save the sum of $450,000 U. S. Cy., which I have in bank bills hidden in a secret compartment of a trunk that is now deposited in a customhouse in the United States.

As soon as I send you undeniable evidence, it is necessary that you come here and pay the expenses incurred in connection with my process, so that the embargo on my suitcases can be lifted, one of which suitcases contains a baggage check that was given to me at the time of checking my trunk for North America, and which trunk contains the sum above said. To compensate you for all your troubles, I will give you the THIRD PART OF SAID SUM. Due to serious reasons which you will know later, please reply via air mail. I beg you to treat this matter with the utmost reserve and discretion. Fearing that this letter might have gone astray and not reach your hands, I will not sign my name until I hear from you, and then I will entrust you with all my secret. For the time being I am only signing "P".

Due to the fact that I am in charge of the prison school, I can write you like this and entirely at liberty. I cannot receive your reply directly in this prison, so in case you accept my proposition, please air mail your letter to a person of my entire trust who will deliver it to me safely and rapidly. This is his name and address: Sr. Valentin Fragoso, Lago Como 204, Mexico City 17, Mexico.

"P"

Mexico City
Mexico

► *If you haven't already gotten your copy of this letter there's a good chance you soon will. Sr. P. has discovered a sucker list of chemists and chemical engineers and is covering the waterfront.*

Old as it is, this "Spanish prisoner" scheme keeps up with the inflationary times: ten years ago the cut was only $10,000 and the hand of the charming young senorita.—Ed.

. . . And Get $150,000

Sir:

I have followed up Sr. P's offer and . . . all I have to do now is to take a plane to Mexico City, pay the prisoner's fine of $9,850, get the court to release his suitcase in the lining of which is hidden the check to his trunk now safely deposited in an undisclosed customhouse in this country, cross the border with his charming 18-year old daughter, claim the trunk, find the $450,000 cached away in a hidden compartment, give the gal $300,000 and high-tail it for home with my cut of $150,000—all this within the next week!

After I get my $150,000 I won't be speaking to you peasants around McGraw-Hill any more!

D. S. Davis
Department of Chemical Engineering
Virginia Polytechnic Institute
Blacksburg, Va.

► *Dale Davis says he's having a lot of fun with this hoary swindle scheme. But we suspect his chemical engineering students are getting a big kick out of it too: the correspondence between Mexico City and Blacksburg, now increasing in tempo and suspense, is posted daily on the department's bulletin board.*—Ed.

Dr. Flanagan's Way—I

Sir:

Dr. Flanagan's paper (Sept., p. 294) on research administrator evaluation gave the impression that sound, able work had been done in this pioneering field, and that his findings should lead to further studies as well as to modified use of some of the basic principles indicated. "Data of verifiable predictive value" are all but unknown in this field; if the method can produce it, a major contribution has been made.

Some successful administrators may doubt whether a research psychologist will soon be able to assemble enough objective data on a research worker to enable the psychologist to make better judgments than an experienced administrator who balances all the factors available to him. Some of these factors cannot be included in any classification list of practical size; some that are of negligible importance on the average loom large in a particular case.

Several areas formerly considered outside the field of rigorous "science" as being subjective are now being brought within it by use of adequate quantities of data and mathematically sound methods of using such data.

Operations research, developed during the war, successfully handles problems involving prediction of human action, such as inspection or sales practices. Odor and flavor problems are brought within definable tolerance limits that are as quantitative, repeatable and reliable as many industrial laboratory analytical, chemical and physical testing techniques.

It may be that Dr. Flanagan can use data on large numbers of individual observations made under controlled conditions through his newly developed procedures to match the judgment of the practicing experienced research executive. He has a long way to go, perhaps because the successful executive has consciously or unconsciously been judging people most of his life, and judging by factors that are not easily summarized on a list to be used by a man inexperienced in this most difficult of fields in which to judge probable success.

In the meantime, Dr. Flanagan's presentation gave the impression of competent work, with constructive results of such practical promise that the work should be continued, and the results already obtained absorbed into the practices of research personnel administrators. They did not seem advanced to the state where a major upheaval in successful research personnel practice was indicated.

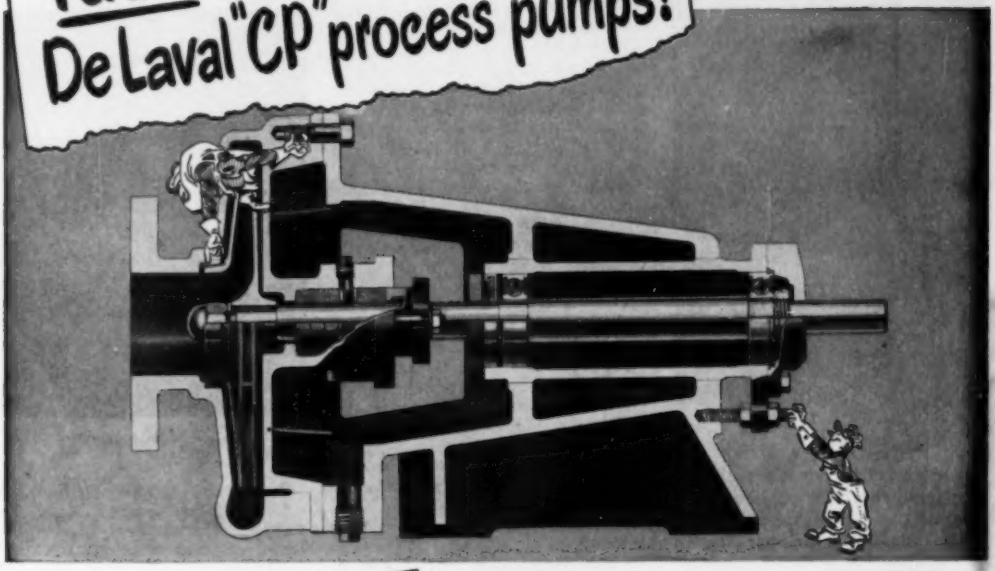
Raymond Stevens
Vice President
Arthur D. Little, Inc.
Cambridge, Mass.

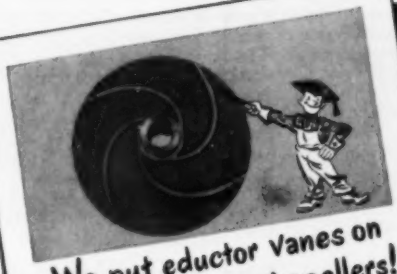
Dr. Flanagan's Way—II

Sir:

If a research department is to be effective, its group morale must be high. Morale is built, in part, by suitable recognition and compensation of individual workers. This requires

Facts you should know about De Laval "CP" process pumps!





We put eductor vanes on the back of open impellers!

Why? Because the eductor vanes develop higher pressures than the pumping vanes. This reduces end thrust, relieves stuffing box pressure, keeps the back of the impeller clean and prevents binding . . . all important points that insure better operation and less maintenance.

NOW! You can adjust a pump for wear without opening it up!

How? It's easy if you have a De Laval CP pump. The secret is in the tapered wearing ring. This means you don't have to replace the wearing ring to restore the pump to its original efficiency. All you do is turn this external adjusting screw. This moves the entire rotor and impeller forward and permits you to adjust for proper clearance between the case and wearing ring . . . *it's as simple as that.*

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CPP-8

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conscientious and objective evaluation of the individual's performance and accomplishments, resulting in appropriate action at suitable intervals.

I do not believe that a formula can be developed to relate performance and compensation directly in any quantitative way. Evaluation of people must obviously be based on information about them, but the principal value in any rating system lies in the fact that its use requires the responsible administrator to *think* about the problem. The "Flanagan system" has the merit of requiring the administrator to look at some of the factual information underlying some of his "good" or "bad" ratings; no rating system, in itself, should be taken too seriously.

Rating of personnel in research is more difficult than in production or sales. A research study leading to a decision not to pursue a certain line of development may save large sums for the company, but seldom impresses top management as being an important research accomplishment. Only the research administrator, conscientiously studying his men, can recognize a good performance of such a nature as warranting greater recognition for the investigator than a less difficult assignment of a type which attracts more attention.

The rating system, especially in the research department, would seem to be of value primarily because it stimulates the "boss" to a considered evaluation of his people, even though he may discard the formula which the system suggests.

THOMAS K. SHERWOOD
Dean of Engineering
Massachusetts Institute of Technology
Cambridge, Mass.

Dr. Flanagan's Way—III

Sir:

Your September article "Evaluating Executives" by John Flanagan has raised an interesting question.

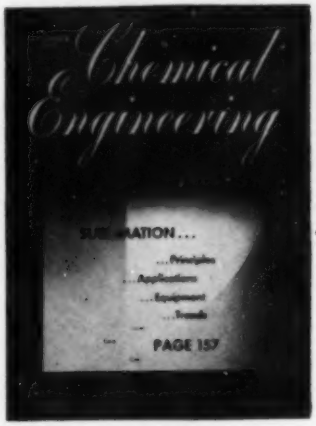
I refer to the chart listing the differences between highest and middle-salaried personnel.

One of the greatest differences between the groups occurs in item 8 d, "Being fair and ethical." According to the chart this item is mentioned almost four times as often for the middle-level people as for the top-level group, indicating that presence or absence of ethical behavior registers a significant difference between the top-level man and the middle-level administrator.

Now my question is this: "Is this item reported as effective or ineffective behavior?"

Or to phrase it more pointedly: "Are these middle-level people kept out of the top-spots because they are fair and ethical or because they are not?"

JOHN W. LYONS
Chemical Engineer
Wantagh, N. Y.



Sublimation Surprise

Sir:

Your recent report by Melvin Nord on "Sublimation" is timely. Certainly very little is known about this chemical engineering unit operation. . . .

That calls to mind that last year I ordered a book on sublimation. When it came in our librarian called up and asked if I was sure I still wanted it.

It turned out to be a profound treatise on a field of religion!

KENNETH A. KOBE
Department of Chemical Engineering
University of Texas
Austin, Texas

►*The religious book (Sublimation by J. T. Davies, Macmillan, 1947) was actually listed by a number of chemical publications!*—ED.

Letter Symbols for Hydraulics

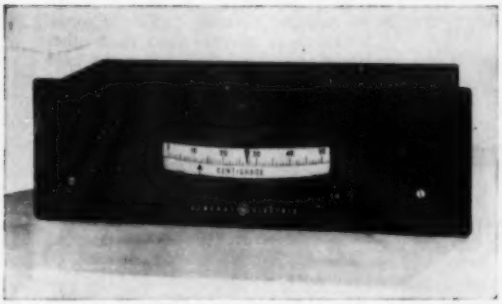
Sir:

The American Standards Association Subcommittee Y10.2 (formerly X10.2) has recently been reconstituted for the purpose of reviewing and revising the 1942 Standards on Letter Symbols for Hydraulics.

The committee would appreciate receiving comments from interested parties concerning the 1942 Standards and any suggested additions or modifications thereof. It has been tentatively decided to consider the field of hydraulics as being concerned with all phases of the motion of liquids. An attempt will be made to include symbols in the field of hydrology and water-hammer. Suggestions and comments should be directed to the Chair-



New G-E resistance thermometers accurately indicate and control low temperatures



FOUR TYPES AVAILABLE—indicators, protectors, and two- or three-position controllers—for either flush or surface mounting.

TEMPERATURES FROM −100 F TO +300 F can now be accurately indicated and controlled with General Electric's new line of resistance thermometers. They indicate accurately within ½ of 1 per cent full scale. Any change in temperature equivalent to 1/10 of 1 per cent full scale starts immediate control action.

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READERS' VIEWS, cont. . .

man, Dr. J. M. Robertson, P. O. Box 30, State College, Pa.

J. M. ROBERTSON
Ordnance Research Laboratory
School of Engineering
Pennsylvania State College
State College, Pa.

Roller Mill Maintenance—I

Sir:

Under the article "What Does Maintenance Cost?" by Jackson D. Leonard in the September issue of *Chemical Engineering*, I note that under the subheading, "Pan and Roller Mills," Mr. Leonard states that the cost range of maintenance on a roller mill when grinding a material such as titanium dioxide would amount to from $2,000 to $7,000 per year, and that the cost would amount to 60 to 70c. per ton handled.

The writer's experience extends over a period of 30 years in the grinding of the various titanium pigments as well as other pigments such as lithopone, white lead, lead silicate and the iron oxide pigments such as the precipitated reds and hematite. He has never yet seen where the cost of grinding a ton of any of these materials would be as high as 60c. a ton. Although a calcined titanium dioxide is somewhat more abrasive than most other titanium whites, still it is not a hard material to grind; the cost of grinding should not exceed 7 or 8c. a ton.

Let us take a standard roller mill such as the 50-in. mill generally used. This mill, on an average grade of TiO_2 would grind from 1.5-2 tons an hour depending on the physical character of the product and on the particle size distribution. Such a mill would grind about 7,500 tons per year, figuring on 20 hours a day operation. The cost of repair parts (including freight charges) and the time consumed in removing worn out parts and replacing them with the new parts would not amount to more than $600 a year.

Of course, when Mr. Leonard states that grinding rings, roll, shafts, bearings and drive mechanism need frequent service it all depends on what he means by frequent service. On a modern mill with modern feed controls, the roll should not be replaced more than once a year and the grinding ring not more than once every two years. As far as shafts are concerned, it is a rare occurrence that a shaft breaks; as far as bearings are concerned there would probably be less maintenance on this item than on an average hammer mill. This is evident from the fact that the vertical shaft on a roller mill does not rotate faster than

about 90 rpm. and the shaft on the roller journal rotates about 300 rpm. In comparison with this, the shaft on a hammer mill might run anywhere from 1,800 to 3,600 rpm. and higher on the smaller units.

Let us now consider some of the other non-metallic minerals which are much harder to grind, are much more abrasive and are often ground to a fineness of a trace on a 325-mesh screen. Even here, when the capacity of the mill might be only 1.5 tons an hour, the maintenance cost rarely exceeds 15c. per ton. By the non-metallic minerals, I mean barytes, calcite, magnesite, hematite and similar materials.

There are many small producers of these non-metallic fillers and they sell at a very low price. If their maintenance cost was anywhere from $2,000 to $7,000 a year they couldn't stay in business very long.

I believe that if Mr. Leonard will go over his figures he will find that they might apply to some particular installation where the mill must have been wrecked in order to show such a high maintenance cost.

S. B. KANOWITZ
Raymond Pulverizer Division
Combustion Engineering-Superheater, Inc.
New York, N. Y.

►*For Mr. Leonard's comments on this letter see Roller Mill Maintenance—III that follows.*—ED.

Roller Mill Maintenance—II

Sir:

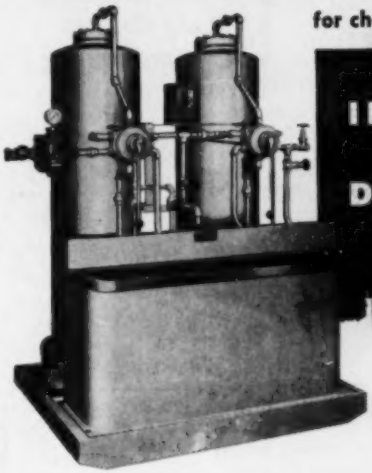
I have read your article "What Does Maintenance Cost?" by Jackson D. Leonard in your September issue; I am amazed at the figures he gives on maintenance of pan and roller mills.

He admits in his letter of transmittal, which you published on p. 252 of the same issue, that his figures are not very accurate. However, the readers of the article will probably not see his transmittal letter and, therefore, it seems to me that these figures should have been checked more accurately before they were published.

Assuming that his statement that costs range from $2,000 per year for smaller sizes to $7,000 for larger sizes of roller mills, we can assure him that he is far out of line. The same thing applies to his figures for titanium dioxide grinding where he indicates 60 to 71c. per ton of material handled.

If these costs were correct, this company could never have sold a Raymond roller mill; yet there are thousands of them in operation throughout this country and in foreign countries grinding innumerable non-metallic minerals, manufactured products, and

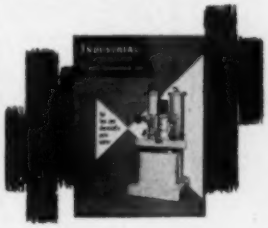
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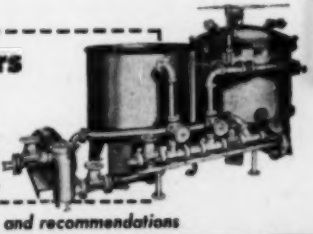
The equipment required is very simple—no heat, steam, or cooling water is used. Units can be made to deliver almost any quantity of purified water. The operation is practically automatic—requiring only limited attention periodically.



Ask for Bulletin 200

This bulletin gives the details on INDUSTRIAL demineralizers with specifications and performance data on the standard models. If you want information on a particular problem, send us a water analysis, degree of purity required, amount in gallons per hour, and whether the flow is to be continuous.

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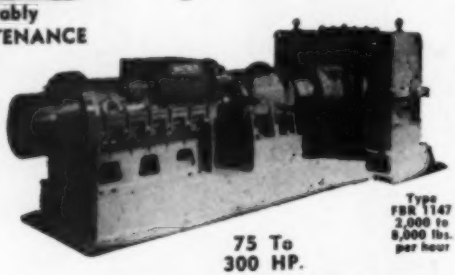
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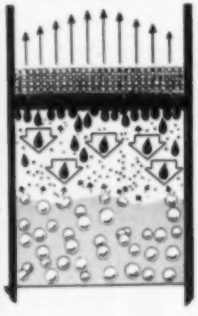
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661 East First Avenue Roselle, N. J.

such things as the pigments, including titanium. Maintenance costs even at present high costs for materials do not average greater than 4-5c. per ton. We will agree that there are exceptions to this and that there have been instances where customers have misapplied our equipment, but not with our consent.

It is mentioned that on Mikro pulverizers, which are nothing more than screen hammer mills, costs run from 4-7c. per ton. This we also very much doubt. Where a screen hammer mill is applicable, and this is only on the soft disintegrating jobs, such costs may be applicable, but there are hundreds of instances where the costs run four to ten times as much.

W. A. KOREN
Raymond Pulverizer Division
Combustion Engineering-Superheater, Inc.
Chicago, Ill.

Roller Mill Maintenance—III

Sir:

Here is my reply to the letters of Mr. S. B. Kanowitz and Mr. W. A. Koren on the maintenance cost on roller mills:

After reading Mr. Kanowitz's letter, I agree with his figures on the handling capacity of a 50-in. mill. But his figure of $600 per year for maintenance wouldn't even pay the cost of a single overhaul on one of these mills. Parts would cost almost that amount; working around the clock on a 24-hr. basis for a week is not at all unusual and would cost about $2,000 for labor alone.

If Mr. Kanowitz can reduce maintenance costs on a 50-in. mill to $600 per year, I am sure that the plant engineer at one large eastern TiO_2 plant would welcome him with open arms.

There is this to be said in Mr. Kanowitz's favor: roller and pan mills are usually used for those nasty grinding operations where no other mill can be used successfully. High cost though they may be, there are still no mills on the market that can replace them for many of the process industry applications.

I quoted this particular large TiO_2 plant as an example because it has a battery of four roller mills grinding titanium dioxide with which Mr. Kanowitz has 30 years experience. These mills are equipped with feed controls, overload protective devices, whizzer separators, etc., and fulfil all the requirements that Mr. Kanowitz might ask for. These particular mills are among those that I have actual cost data on.

POLYESTER RESINS..... *Dr. Earle Ebers*

Ever since Dr. Earle Ebers delivered his comprehensive paper on polyesters at the National Technical Conference of the Society of Plastics Engineers earlier this year, wide interest in his report has been expressed.

For this reason, Naugatuck here reprints highlights of that report. As many of you know, Dr. Ebers and his Naugatuck associates are among the polyester pioneers who have contributed to the phenomenal growth of this remarkable resin.

If you wish the full text, the coupon below will bring it to you, along with the other data specified.

In 1942, polyesters, as we now generally know them, were born and a new class of thermosetting resins of the following properties was available:

- **Good aging**
- **100% reactivity**
- **Rapid curing without porosity**
- **Wide viscosity range**
- **Good chemical resistance**
- **Good electrical properties**
- **Good abrasion resistance**
- **Wide color range**
- **Good temperature shock resistance from −80° F. to 212° F.**

In combination with fibrous fillers such as nylon, cotton, sisal, rayon, paper and, in particular, glass, polyesters have the above properties plus:

- **High specific tensile and flexural strength**
- **High impact resistance**

WAR USES: The handling properties of low viscosity, 100% reactivity and rapid curing without porosity under no or a minimum pressure permitted that American production ideal of continuous operation in the lamination of glass cloth. Large quantities of sheet stock of this nature were made. These were used as support panels for self-sealing gasoline tanks in aircraft.

More complex aircraft structures such as air scoops, water and de-icer tanks, wheel farings and ducts quickly followed as experience with these versatile polyester resins grew because they gave:

- **Weight savings**
- **Elimination of costly tooling**
- **Man and machine hour savings**
- **Versatility**

The excellent physical and dielectric characteristic of these laminates were utilized in radomes.

WAR DEVELOPMENTS: Experimentation on structural sections such as the BT-15 airplane fuselage by the AAF Material Command, Wright Field, clearly demonstrated that polyester fibre glass laminates compared to metals and, in particular, 24 ST aluminum have:

- **Higher specific strengths**
- **Greater damping capacity**
- **Better thermal insulating properties**
- **Better acoustical insulating properties**
- **Possible fabrication advantages in time savings and simplified structures**
- **Greater adaptability to variable gauge sections**

These advantages were further borne out when the constructions of the Sikorsky Aircraft B-6 Helicopter cabin was changed from metal to plastic with:

- **Over 10% saving in weight**
- **Greatly reduced noise level**
- **A reduction in parts to assemble from several hundred to only 26**
- **Approximately a 50% reduction in production time**

Simple boat structures were a "natural" and appeared early on the scene.

A great developmental saga had been written and enthusiasm was rampant for the post-war possibilities of this Cinderella when the war came to a close and the fairy godmother was gone.

Polyester resin sales rose from perhaps 1,500,000 pounds in 1946 to 7-8,000,000 pounds in 1950 and these resins were used in the following amazing variety of products.

CONTINUOUS LAMINATIONS: This was probably the first and simplest conversion: Two polyester-bonded glass cloth products finding peacetime usage as cargo liner and photo template. Immediate introduction of a paper laminate into the wall board and decorative table top field also helped to absorb some of the capacity of these machines.

CAST SHEET AND TUBING: Abrasion resistance and good optical clarity are utilized for glazings, while the excellent electrical characteristics of these resins lead to parts for electronic and radar equipment. Further, they replace more expensive amber in x-ray equipment.

FISHING RODS: By applying the very high strength-to-weight ratio of polyester-bonded parallel glass fibres to rod-making, in analogy with the natural bamboo product, this new fisherman's delight was born.

BOATS: This application was a logical extension of the armed services' experimentation in this field. With new techniques, commercial boats of more versatile design are being built with 45 to 90% savings in man-hours. Other plusses are lighter weight, salt water resistance, imperviousness to rot and worms, no annual caulking and high impact resistance.

LUGGAGE AND CARRYING CASES: The abrasion resistance, high strength properties, light weight and integral color lend themselves to attractive carrying cases for musical instruments and luggage.

AUTOMOTIVE: Lightweight, ease, and economy of repairs are the main advantages. Competitive costs have only been obtained to date in cases such as trailer fenders and electric cruising car bodies where the total of pieces required was small.

SEALANT FOR POROUS CASTINGS: Excellent against petroleum products and thermal shock.

LAMP SHADES: High light transmission permits lower wattage bulbs. Easy cleaning, strength and resistance to heat and moisture are other features.

OUTDOOR SIGNS: Good weathering, toughness, lightweight and integral color contribute to low maintenance costs.

STREET LAMP GLOBES AND REFLECTORS: Toughness towards sharp stones, good light reflectance, and good weather resistance make this a highly practical application.

TRUMPET MUTES: This is a typical example of the hollow articles which might be made in a single piece, having no joints to develop weakness under continuous vibration.

PROJECT TOOLS: Polyester glass laminate project tools in the aircraft industry give large time and money savings over metal tools and do a better job. They are less liable to distortion and damage in service.

LARGE PIECES: That size is no limitation to polyester glass laminate structures is evidenced by the 650-pound synchroton piece and the 700-pound Westinghouse photometer sphere made from them. High strength, good dimensional stability, excellent electrical properties and weight savings are additional features.

MOLDINGS: The fast curing of polyesters has given molding compounds for the electrical industry—with very high tracking resistance and 30-90% greater productivity. Other special formulations give rapid production of television antenna holders and tough, colorful battery boxes.

FUTURE OF POLYESTERS:

Now comparative to the technology of woods and some metals, the chemist and engineer have hardly turned the first pages in their thinking on polyesters and polyester fibre combinations. If, as established in the 1946-1950 period, these are already competitive in many cases, can there be doubt as to their future potentialities?

Structures from buttons to atom smashers, flat sheet to B-29 duct work, and work trays to radomes, attest to the handling and physical properties and versatility of these materials.

In conclusion, it is suggested that application of your creative imagination and ingenuity to these materials will yield high rewards similar to those attained by the dreamers of 1944 and 1945, a large percentage of whose ideas are now commercial realities.

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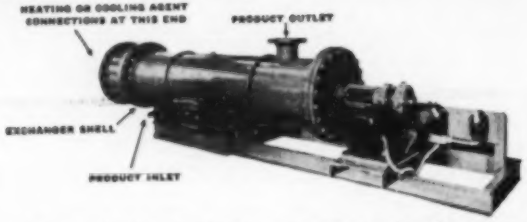
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When maintenance cost records are established and kept over a period of time, it is sometimes amazing to find where a major portion of the maintenance dollar goes and be freed from the vagaries of the maintenance foreman trying to remember how many times he repaired a given machine.

I feel that I am fortunate in having actual cost data from accurately kept maintenance records from a number of plants in the chemical industries. Unfortunately, I have no data from mining or related industry, so that the Raymond claim of $500-600 per year in such applications may be justified. But I would like to see those machines!

As yet, I haven't seen anything in the chemical field which would lead me to believe that my figures are wrong; if I thought that they were, I would not hesitate to apologize and have any error corrected.

I repeat, the figures I presented are from a limited number of plants, but are from accurately kept records which were kept only for the purpose of determining true maintenance costs. You will remember that I contacted about 100 companies for maintenance cost information before starting to write the article and was astounded to learn that so few kept records on individual equipment items. However, perhaps this little discussion might bring out forcibly the point that such records are highly desirable and can be made to "pay off."

JACKSON D. LEONARD
Consulting Chemical Engineer
Metuchen, N. J.

Is Your Firm Guilty?

Sir:

I am a chemical engineer serving as general manager of a medium size pharmaceutical plant outside the United States. . . . Practically all our equipment has been bought in the USA from the most reputable manufacturers. . . .

We have been very well pleased with the operation of this equipment. But when it comes to getting urgently needed replacements and parts, we have been plagued with shut-downs and delays. The ineptitude and just plain forgetfulness of many of these companies is almost unbelievable, even after making reasonable allowance for the demands of the USA defense program on the firms' operations. Here are some specific cases from my own experience:

1. A leading centrifuge manufacturer furnished three perfectly fitting filter bags with his 48-in. centrifuge. But when we needed a replacement,

it was two shipments and nine filter bags later before we got one that fitted. *Would you give that firm any more of your new business?*

2. A pump manufacturer promised us delivery on a certain date. Six months later he wires, "Pump ready, send money." We send the money—but he doesn't ship the pump until half a year later. When we do get it, a part is missing. The name plate warned "do not put into operation until reading the instructions carefully"—yet the instructions were not sent. We finally got the missing part and instructions after three months of urgent requests. Why did it take 90 days to get an instruction sheet when the manufacturer is within one day from New York by rail and we are within six days by weekly steamer? *Would you give that firm any more of your new business?*

3. A filter press manufacturer sold us a 36-in. press with gas holes in the cross-head casting big enough to put your fist into. These weren't hidden ones, either; they were uncovered by the machining of the center hole for the screw standard. Do they save the bad ones for export? Naturally the cross head broke. We paid for a new one, of course—and were shut down for five weeks. *Would you give that firm any more of your new business?*

4. A manufacturer of filter cloth advised us he had the cloth we wanted in stock and would put it on the next ship. Six ships came in, but no filter cloth. Finally we needled him into remembering to put it on the "next" (7th!) ship. *Would you give that firm any more of your new business?*

I don't like to carp, but these needless shutdowns can be maddening. Why are so many U. S. equipment manufacturers apparently so casual about the service they give export customers? European manufacturers seem to care more about post-sales service.

It seems to me that one thing is bound to happen: American equipment manufacturers will lose their export markets. I hope they wake up . . .

I. D. CANTOR

Oranjestad
Aruba, N. W. 1.

▶*We are publishing this letter in full because it is typical of the complaints we have heard from other foreign users of American equipment. Just a few weeks ago a well-known American engineer familiar with the chemical process industries in South America spoke bitterly on the same subject: "Many American firms," he said, "will certainly lose their foreign trade unless they correct—and correct quickly—their sloppy ways of servicing the foreign users of their products."*

(Continued)

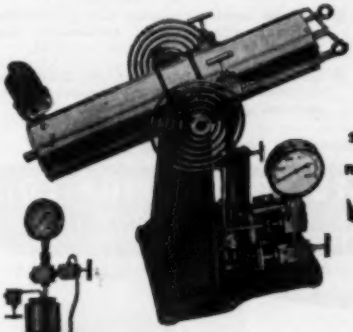
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READERS' VIEWS cont. . .

The fault, this engineer feels, lies largely in the lower echelone of the engineering, shipping and export departments. Unfortunately, the foreign users of American equipment gain their impressions of these companies only through these long range contacts.

The foreign market for American-made processing equipment is normally about 10–12 percent of the domestic market. Will we lose it? That, it seems, is a big question and a challenge.—ED.

Foods or Poisons?

Sir:

Many thanks for the editorial comments on the use of chemicals in foods that appeared in the recent issues of *Chemical Engineering*. That's really sound talk. . . .

With the life expectancy going up year by year, it's hard to see how the chemists are killing all the people. Foolish legislation can knock out a very important segment of the chemical profession—a segment that is bound to become more needed as the years go on.

LAWRENCE H. FLETT
President
American Institute of Chemists
New York, N. Y

We welcome pertinent letters from our readers. Address: The Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

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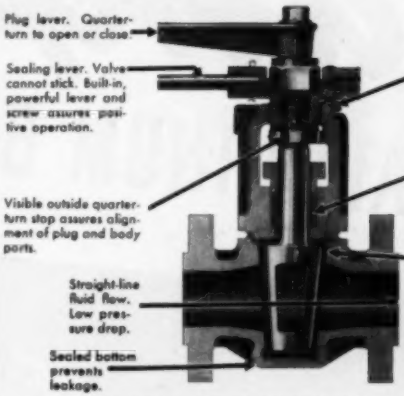
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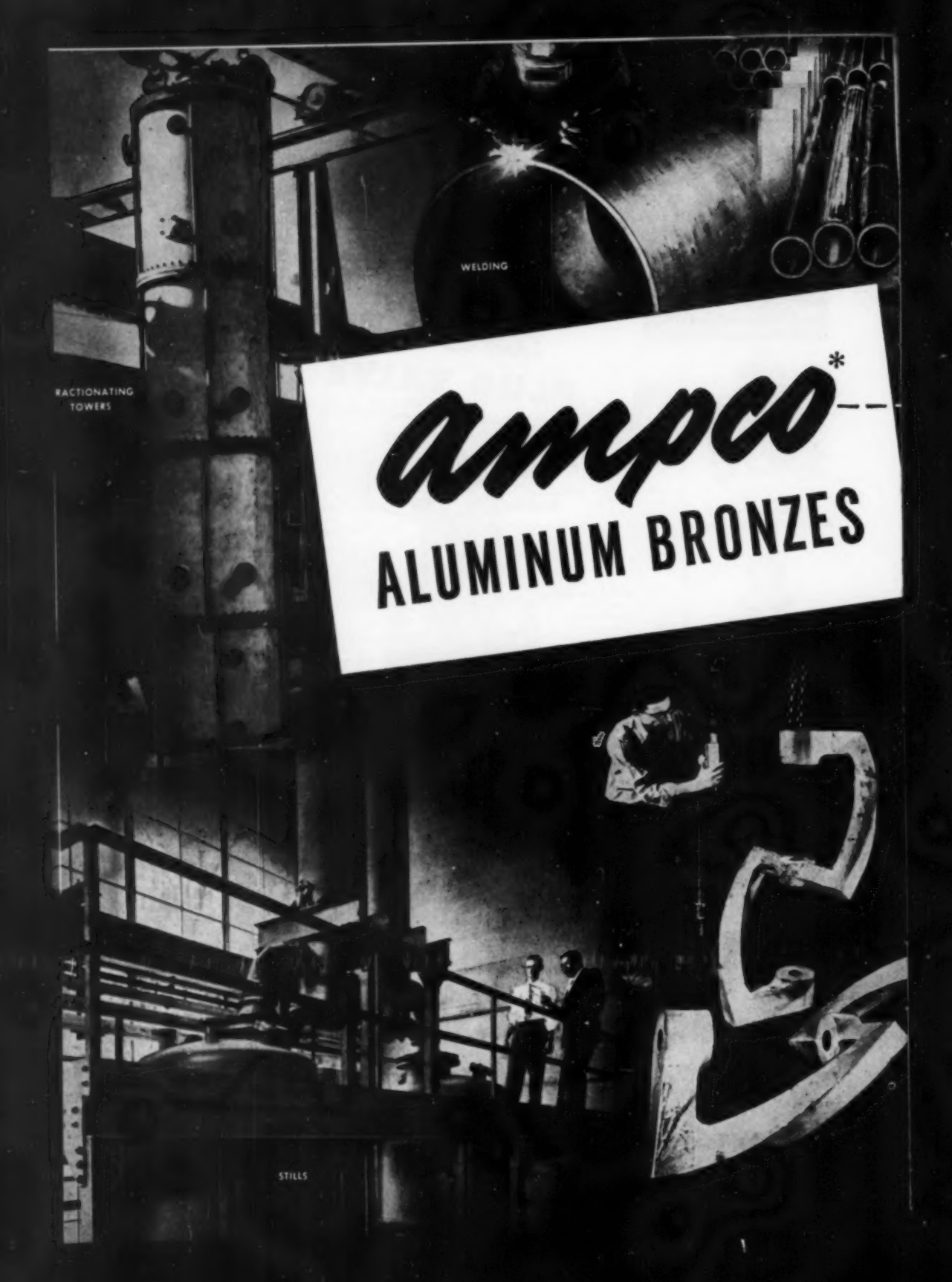
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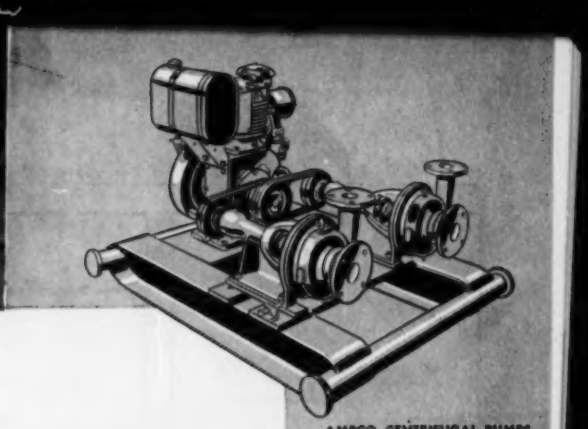
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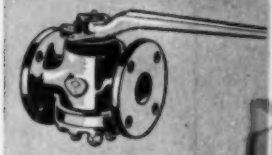


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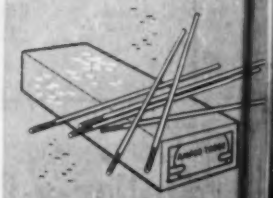


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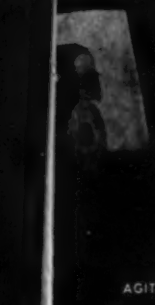


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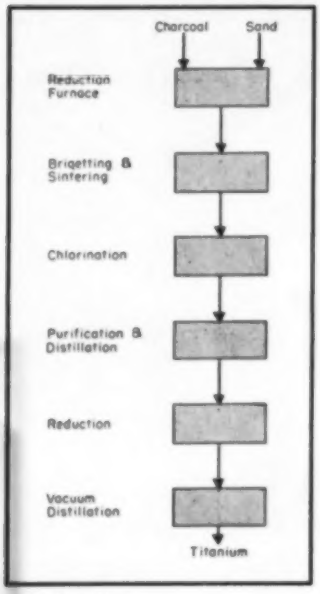
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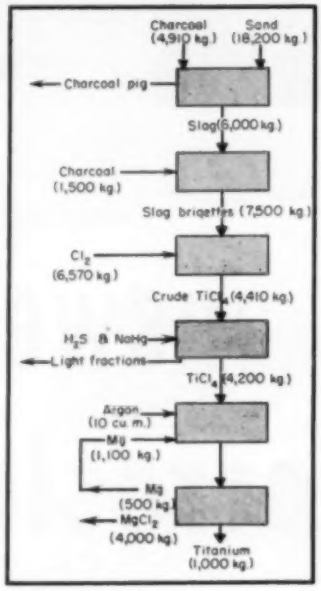
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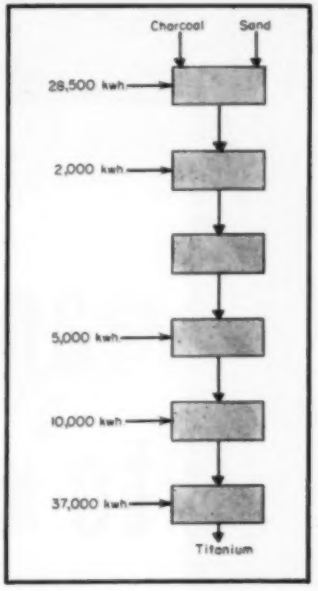
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MATERIALS



POWER

Dollar-a-Pound Titanium?

Production costs can go to this and even lower, say Japanese owners, if they can operate their new process on a large enough scale.

There's titanium galore in the iron sand deposits of Japan. Now a young Japanese chemical engineer has found a method of recovering the metal. His company, Osaka Special Steel, believes the process if run at a big enough scale will produce titanium at a cost of well under $1 per lb.

Four basic operations make up the process: (1) Reduction of iron sand in an electric furnace producing charcoal pig iron and titanium bearing slag. (2) Chlorination of the slag, producing titanium tetrachloride. (3) Purification of the titanium tetrachloride. (4) Reduction of the titanium tetrachloride with magnesium and vacuum distillation to produce metallic titanium. Metal so far produced in laboratory operations analyzes 99.5 percent titanium.

For many years the company has produced charcoal pig iron from iron sand by electric furnace methods. The resultant slag was known to contain about 50 percent titanium oxide.

Hiroshi Ishizuka, young son of the firm's founder-president, went into the family laboratory after graduating from Osaka University in 1946. Early this year he came out with a method of refining titanium from this slag. Now Osaka Special Steel plans to move the process from the laboratory to the refinery.

Development of production as outlined by Osaka's President Kojiro Ishizuka is in two major steps: (1) Pilot plant will go up within the framework of the present company. Estimated production costs on a 3-ton operation are calculated at $2.50 to $3 per lb. (2) The industrial plant expansion will be organized in a new company. At first production plant capacity would be 10 tons per month with later expansion to 30 tons. Initial capitalization would be at around $500,000, which will rise to $1 million when the 30-ton operation begins. Production costs would be around $2.25 per lb. initially, dropping below $2 when the plant reaches full operation.

Eventually, Ishizuka expects production to be raised above the 30-ton-per-month level. This will require development of new electric power supply. He thinks it would be wise to build a 100-ton or larger refinery directly at a company-built and owned power source. Such a power plant and refinery will cost $6 million. Titanium cost would drop below $1.

Ishizuka hopes to find an American partner to go into this project with him. He believes that the primary titanium market for years to come will be in the U. S.

BRAZIL

Complete line of synthetic resins for the paint and varnish, plywood, paper and textile industries will be manufactured in Brazil by Resana S.A. Industrias, Quimicas, Sao Paulo, as a result of an agreement with Reichhold Chemicals, New York. A new plant, incorporating the latest resin manufacturing tech-



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DOUBLE PIPE EQUIPMENT is available in two types; EXCHANGERS, for cooling with water, brine, and cold filtrate, and for heating with steam or hot liquids; and CHILLERS, for use with volatile refrigerants such as ammonia, propane, and Freon. Both types have 8" jacket pipes and 6" inner pipes with scrapers.

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Write for Bulletin PE-1



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BERRY AT NORTH 13th STREET
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niques used in Reichhold operations, will be erected on the outskirts of Sao Paulo with the assistance of RCI engineers.

Nation's petroleum problem may be solved by utilizing the considerable local deposits of oil-bearing shale. Two different surveys have been developed of the prospects for a refinery located in the valley of the Rio Paraiba between Rio and Sao Paulo. Each is based on a plant to produce 10,000 bbl. daily.

According to the National Petroleum Council, Foster-Wheeler Corp. has been studying the situation and has estimated that such a plant would cost the equivalent of $35 million, producing 40 percent gasoline, 40 percent fuel oil and 20 percent diesel oil. Shale consumption would be 20,000 tons daily.

Meanwhile, Swedish experts from the famous Quantrop plant have estimated that a 10,000-bbl. plant, including production of byproducts like sulphuric acid, would cost the equivalent of $25 million.

A third American plastics manufacturer has appeared on the Brazilian production scene. B. F. Goodrich Chemical Co. will be associated with Industrias Reunidas F. Matarazzo of Sao Paulo, South America's largest industrial combine.

Two other American firms have entered the Brazilian market in the past few months—both in conjunction with local investors. Koppers is to manufacture polystyrene at a $500,000 plant in Sao Paulo and Monsanto S.A. will make polyvinyl chloride at a $2 million plant in the same area.

These new projects will give Brazil a substantial plastics industry. Already established are Bakol S.A., with a $1 million plant making polystyrene. It is an affiliate of Union Carbide. Cia. Quimica Rhodia Brasil, a subsidiary of the French Soc. des Usines Chimiques du Rhone-Poulende, has been making cellulose actetate for years in connection with its rayon production. And four smaller firms—Resinbra S.A., Sacra S.A., Plastiresina Ltda. and Ambalit S.A.—have been manufacturing phenolic resins.

BELGIUM

Plastic pipes, 10 times lighter than lead pipes, are now being manufactured in Belgium by the chemical concern, Societe d'Arendonck of Arendonck, Antwerp Province. The

pipes are said to be impervious to chemical liquids (but not to mineral oils), will not burst during cold spells and can be attached to any other types of piping. However, they could not withstand temperatures above 65 deg. C. They are being made in lengths of about 40 to 100 ft. with interior diameters of ¼, ¾ and one inch. Their cost is stated to be 40 to 50 percent less than that of lead pipe.

CANADA

Fuel gas from wood waste is now being made at a $20,000 experimental plant built by British Columbia Research Council. The council hopes this project will be the source of a new industry for the west coast of Canada.

Alberta oil instead of American coke will be used in production of carbon dioxide at Liquid Carbonic Canadian Corp.'s $500,000 plant being built in Winnipeg. Designed as the most modern in Canada, it will double the company's present output.

Yarns and fibers for the textile industry, in addition to chemicals, will be produced at the new $54 million Edmonton, Alberta, plant of Celanese Corp. of America, being built by Canadian Chemical Ltd., a Celanese subsidiary. Scheduled to be in operation in 1½ years, the plant had previously been announced for production of organic chemicals only.

High alpha cellulose will be supplied by the Prince Rupert plant of Columbia Cellulose Co. Ltd., another Celanese subsidiary. Production will include 15 million pounds of staple fiber and filament yarn annually. Cellulose acetate output will be 25 million pounds, of which 10 million will be for export.

Other chemicals to be produced will be pentaerythritol for quick-drying auto finishes and other items, propylene gycol for permanent antifreeze solutions, acetaldehyde for insecticides, and formaldehyde for the plywood glue market in British Columbia.

Formaldehyde and pentaerythritol will be the initial products of a new chemical plant planned by Shawinigan Chemical Ltd. and Heyden Chemicals for the Province of Quebec. The project will involve an expenditure of at least $2 million. Both companies will be equal partners in the plant which will have an annual capacity of 30 million



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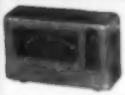


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pounds of formaldehyde and 3 million pounds of pentaerythritol.

Novel underground processing—using giant electrodes—of northern Alberta's big tar sand deposits, the world's greatest known oil reserve, has been proposed by Dr. E. M. Davis of Pennsylvania State College. Attending a 5-day conference at Edmonton on the Athabascan oil sands, Dr. Davis proposed to the symposium that metal pipe electrodes be placed in the sands to a depth of 50 ft. at intervals of 30 ft. over a circular area.

Heat created by the electrodes would force pores and tunnels through the mass; compressed air or natural gas would then be forced in and combustion would support the electrically generated heat. The unheated sand stratum below the area being volatilized and the overburden would seal in the heat so that the temperature would reach about 1000 deg. F. The resultant partially cracked oil would be siphoned off.

Sulphuric acid facilities of Nichols Chemical Co., Ltd., will be doubled by a $2.5-million project at Valleyfield, Que. Initial production from the new plant is expected by the spring of 1952.

Expansion is aimed at increasing Canada's sulphuric acid supply by using domestic sulphur-bearing ores as raw material in place of critically short elemental sulphur. The new plant is designed to take full advantage of Canada's vast resources of pyrites and other ores.

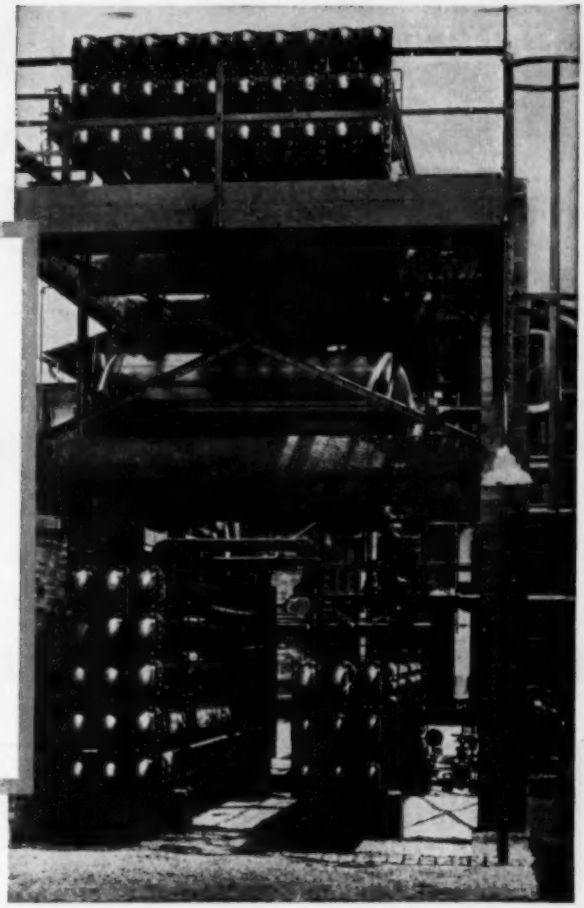
Propane gas as a substitute for gasoline has been tested on five propane-converted buses for the past ten months by British Columbia Electric Co. in Vancouver, B. C. From an economy standpoint, the buses have shown about 30 percent less oil consumption, 10 percent more fuel consumption. The five buses, some of which have traveled upwards of 23,000 mi., have shown a slight increase in power and a noticeably smoother, more responsive operation compared with vehicles using gasoline.

Test results were good enough to lead company officials to consider converting nearly 300 gasoline buses in the area to propane. The hitch is an adequate supply of fuel at a stable price, and assurance of regular delivery over a long period.

BCE ran into only one difficulty with propane—a high sulphur content. Upon vaporization of the

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Have you ever thought how convenient it would be to be able to "stock" heat exchangers . . . just as you do with valves, fittings and bolts . . . so as to have them ready as quickly as you need them for heat transfer services?

You can do it with the G-R Twin G-Fin Section . . . the multi-purpose heat exchanger. These units can be set up in stacks just like a sectional book-case. They can be grouped in parallel or series for complete flexibility of capacity and temperature range. You can use them for practically any condensing, cooling, heating or heat exchange service. They are easily and quickly transported and piped up.

When you need a new heat exchanger, just write, phone or wire us to ask the Twin G-Fin Section set-up that will do the job. If the service conditions of an existing Twin G-Fin Section installation are changed, it's a simple matter to add or remove one or more sections. And if an existing installation is no longer needed because of process changes, the units can be disconnected and returned to the storeroom for "stock", to be held until the next call for heat exchangers.

Many plants are already doing this. These plants need not wait for specially designed and manufactured heat exchangers for most of their services, nor do they have to pay the cost of "tailor made" units.

Just think of the advantages for your own plant . . . and write us for full information.

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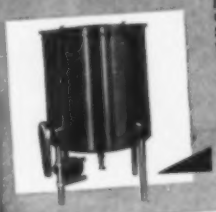
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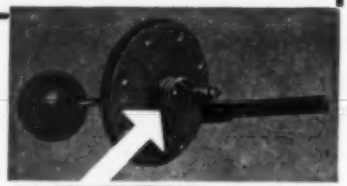
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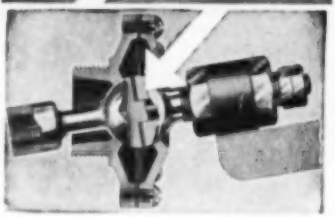
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The patented Davis "DIA-BALL" Transmission is a leak-proof, packless diaphragm ball transmission arm for Davis Liquid Level Controllers, Float Boxes and Float Lever Units. Engineers recognize its superiority over the conventional packing box. Here's why: (1) Ball and socket joint, insures accurate power transmission; (2) Straightlined Power eliminates lost motion, minimizes friction, providing maximum accuracy and sensitivity; (3) Simple construction minimizes maintenance—no leaky shaft or stem packing—no packing box nuts to tighten; (4) Dangers inevitable with volatile or inflammable liquids are eliminated because of Dia-Ball leak-proof feature. Write for details.

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FOREIGN NEWS, cont. . .

liquid propane and application of heat in the regulator, sulphur was precipitated and the regulator quickly became erratic in operation. Particles of sulphur, in conjunction with small amounts of compressor oil in the propane, would adhere to the secondary valve causing imperfect fuel control and, in many cases, fouling the valve so that the fuel flow continued after the engine had stopped, with the resultant frosting of the regulator and the line to the carburetor. Receipt of relatively sulphur-free fuel eliminated these difficulties.

ITALY

New chemical polishing process for aluminum is based on the simultaneous action of phosphoric acid and a mixture of acid salts of alkaline metals and alkaline earths. Called Alubril II, process is unique in that the acid polishing bath does not attack the rustless austenite steel of which the containers for the polish are made. The special composition of the bath makes it unnecessary to immerse the polished pieces in a nitric acid bath. Process was developed by the Light Metal Experiment Institute, Milan.

Possibilities for synthetic rubber manufacture in Italy is under investigation by the Ministry of Industry which is collecting data from the crude oil refineries. During the war some 13,000 tons was produced in a plant near Ferrara but the experience offers little guidance because of the abnormal economic situation at that time.

FRANCE

Big sulphuric acid plant, destroyed during the war, has been rebuilt and modernized. The plant, near LaRochelle, is owned by the Etablissements de l'Union Francaises des Fabriques d'Engrais et de Produits Chimiques. It has a daily production capacity of 40 tons but will depend on large imports of pyrites.

Alcohol producers and the nation's chemical and petroleum industries have formed a study group to examine the practical possibilities of establishing a synthetic rubber industry in France as an outlet for surplus alcohol production. About 26.5 million gallons annually is produced from sugar beets. Minimum production of 40,000 m.t. of synthetic rubber annually would be

necessary for establishment of the new industry on a sound basis. French synthetic rubber consumption amounts to only 12,000 m.t. so a major question to be studied will be the possibilities for competing with U. S. and Canada for export markets.

COLOMBIA

Alkali plant rated at 100 tons a day soda ash and 25 tons a day caustic has recently been completed in Bogota. To be operated by the Instituto de Fomento Industrial (government agency in charge of industrialization), the plant was designed, engineered and constructed by H. K. Ferguson.

Known as the Betania Alkali Plant, it is the first of its kind in South America. Designed for the ammonia-soda process, the plant can get all raw materials locally.

ISRAEL

Tire and rubber plant, the first in the country, will launch production in Haifa by the end of the year. The initial capacity of 2,500 tons a year will be increased later to 3,600 tons. The $1 million enterprise is jointly owned by General Tire & Rubber Co., Akron, the Palestine Economic Corp. of New York and two Israel firms.

New chemical plant at Haifa is already working on methods of using potash from the Dead Sea and rock phosphate from the Negev. The only imported material will be pyrites from Greece. Sulphuric acid and ammonium phosphates are already in limited production while calcium phosphate, potassium sulphate, nitric acid and ammonium nitrate will be added by the end of 1953. Large American and local government concerns are present owners of the plant.

NORWAY

Magnesium oxide will soon be produced on a commercial scale by the Jeroeya Electro-Chemical Factory in southern Norway. Next autumn production of metallic magnesium will begin at 3,000 tons a year.

GERMANY

Basic phosphorus and C.P. phosphoric acid will be produced by A. G. fuer Stickstoffduenger of Knapsack, Koeln, who have just gotten the go ahead from the Allied High Command. The firm plans to install an electric furnace with a capacity of 10,000 kw. —*End*

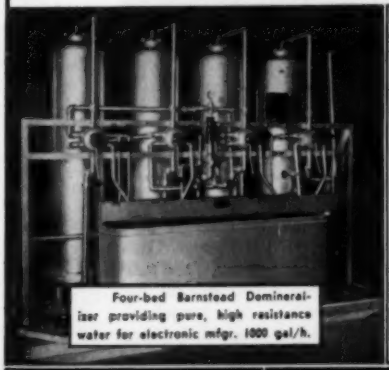
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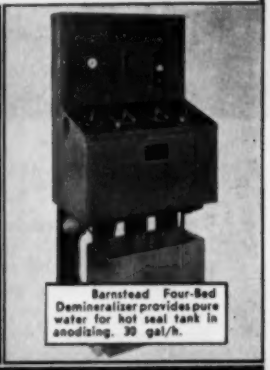
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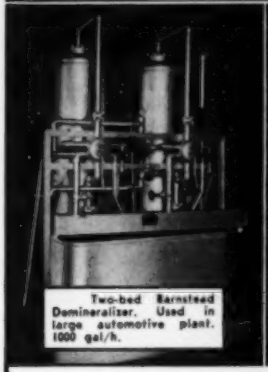
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Barnstead Four-Bed Demineralizer provides pure water for hot seal tank in anodizing. 30 gal/h.



Two-bed Barnstead Demineralizer. Used in large automotive plant. 1000 gal/h.



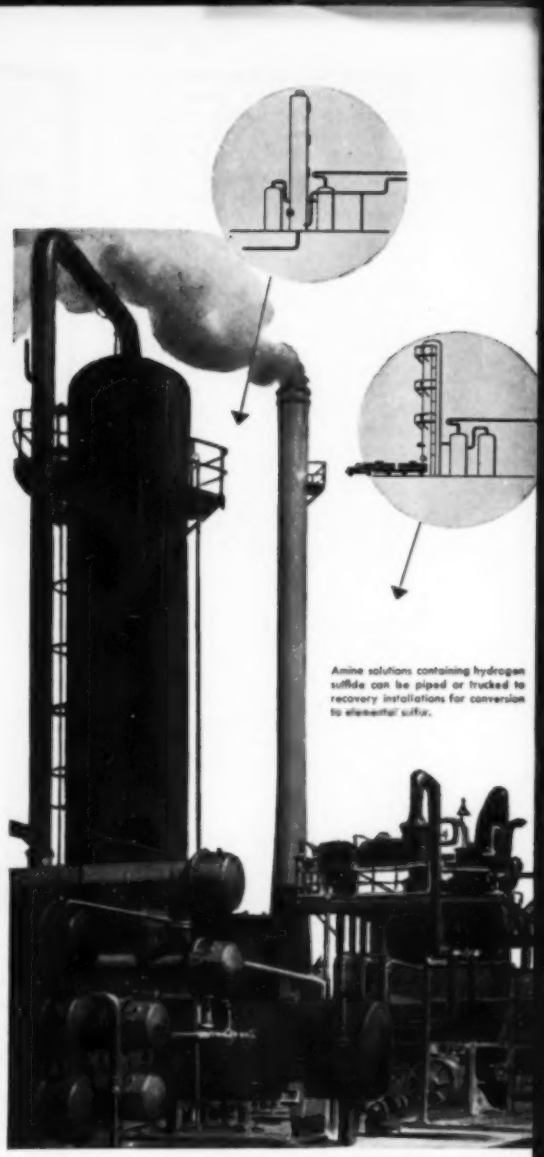
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For example, the ethanolamines can be used to recover hydrogen sulfide which can be converted to elemental sulfur. Also, you can control sulfur fumes with resulting lower maintenance costs from reduced corrosion. And, by preventing atmospheric contamination, your industrial standing in the community will be greatly enhanced. Many other uses can be developed for the ethanolamines in detergents, and cleaning and polishing compounds.

Despite today's shortages, Dow is interested at all times in helping you use the ethanolamines to best advantage in your present operations or in experimental work for future uses. For more information and technical assistance, write Dow using coupon at right.

Properties of Ethanolamines

	Monoethanol-amine	Diethanol-amine	Triethanol-amine
Molecular Weight	61.1	105.1	149.1
Boiling Point (760 mm.Hg), °F.	338.9	516.4	680.0
Freezing Point, °F.	50.0	81.7	87.6
Specific Gravity (77/77°F.)	1.015	1.093*	1.120
Refractive Index (77°F.)	1.453	1.475	1.483
Flash Point, °F.	185	285	—
Fire Point, °F.	190	330	—
Heat of Vaporization, cal./gm.	206.5	128.2	60.1
Heat of Fusion, cal./mole	3915	5351	3200

*at 80/77°F.

Solubility of Ethanolamines (at 77°F.)

	Monoethanol-amine	Diethanol-amine	Triethanol-amine
Acetone	∞	∞	∞
Benzene	sl. sol.	sl. sol.	sl. sol.
Ether	sl. sol.	sl. sol.	sl. sol.
VMP Naphtha	sl. sol.	sl. sol.	sl. sol.
Methanol	∞	∞	∞
Water	∞	∞	∞

This is one of a series of Dow advertisements you may wish to keep on file for reference and information. Write Dow for reprints.

USES OF ETHANOLAMINES

gas treatment



Monoethanolamine is used in removing carbon dioxide and hydrogen sulfide from gas streams. Then, the hydrogen sulfide may be selectively burned to produce sulfur.

When methane is burned to produce carbon monoxide and water in the manufacture of methanol, a certain amount of carbon dioxide is produced. This carbon dioxide, which would interfere with later operations, is removed with monoethanolamine.

Methane is scrubbed with monoethanolamine prior to making carbon black. This scrubbing removes any hydrogen sulfide which would subsequently be converted to sulfur and contaminate the carbon black.

Diethanolamine is used in much the same manner as previously described for monoethanolamine. However, diethanolamine may be used in cracking gases and coal or oil gases which contain carbonyl sulfide that would react with monoethanolamine.

surface active agents



Monoethanolamine and triethanolamine may be reacted with sulfonated alkyls or fatty acids to produce detergents, soaps, shampoos and various cleaning compounds. To this date, the largest single use is in the production of a moderate duty household detergent.

Diethanolamine is used extensively in the production of lubricants for the textile industry. These lubricants can be easily removed by the use of a detergent. Also, diethanolamine is used in detergents, soaps and cleaning compounds.

cleaning and polishing compounds



Triethanolamine is used in the manufacture of cleaners and polishes for metals, wood, leather, floors, and furniture. Triethanolamine soaps act as emulsifiers and dispersing agents in these applications. Triethanolamine is also used in automobile polishing, cleaning and degreasing compounds. It is used in emulsion stabilizers and dispersing agent for waxes and industrial lubricants.

miscellaneous uses



Monoethanolamine is reacted with other chemicals to produce an accelerator which has greatly reduced the time required for producing penicillin. Monoethanolamine is also used in a variety of other products such as wax removal compounds.

Diethanolamine is used as an emulsifier and dispersing agent in various agricultural chemicals, cosmetics and pharmaceuticals.

PRECAUTIONARY MEASURES

The ethanolamines do not present an appreciable fire hazard. Monoethanolamine has the lowest flash point of the three (185°F.) and should not normally present a hazard except in cases of large leaks or spills.

The ethanolamines present no unusual toxicity hazards. Monoethanolamine may cause skin irritation in concentrations greater than 1% and contact should be avoided as much as possible. Diethanolamine is markedly irritating in concentrations greater than 10%. Triethanolamine is not seriously irritating if diluted and will probably cause no serious difficulty unless prolonged or repeated exposures are encountered.

Strict precautions should be observed whenever there is a possibility of eye contamination with an ethanolamine. All persons should wear face shields, goggles with side shields, or the equivalent. Suitable facilities for washing the eyes should be readily available. If contaminated, the eyes should be washed with large amounts of flowing water and medical aid should be summoned.

If an ethanolamine is spilled on the person, all contaminated clothing should be removed and not worn again until decontaminated. The exposed area should be washed with plenty of flowing water and medical aid should be summoned for victims of extensive or prolonged exposure.

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Alcohol vs. Construction Materials

NOTE:—*Alcohol vs. Construction Materials appeared first in our September and October 1948 issues. Since then we have received information on eight additional materials, which we present here together with a condensed version of the original discussion. The introductory portion is by William C. Moore, U. S. Industrial Chemicals, Stamford, Conn.*— EDITOR.

At temperatures up to its boiling point (78.4 deg. C.) pure ethyl alcohol is probably less corrosive toward iron, steel and copper than any other common liquid. It also has little or no action on solder, tin and lead. However, in the presence of air and in aqueous solutions, if couple effects can be set up between two or more of the above metals, corrosion may occur at elevated temperatures, especially with iron, solder and lead.

Owing to the ease with which the ethylates of aluminum and magnesium may be formed, especially at elevated temperatures, ethyl alcohol may be regarded as a corrosive agent for these two metals. This action is enormously increased in the presence of mercury or its alcohol soluble salts.

Exceedingly small amounts of some impurities may enhance enormously the corrosive action of alcohol, especially toward iron and steel. A certain sample of high grade alcohol was found to have very little, if any, corrosive action toward sheet steel immersed completely therein for 51 days. On the other hand, this same alcohol contaminated with only 0.001 percent (1 part per 100,000) of sodium chloride began to corrode a similar piece of steel within twenty minutes. These tests were made at room temperature. Still another sample of alcohol had practically no action on a piece of steel partly covered by it for a period of four years.

Alcohol, originally non-corrosive, may become highly active toward metals if it becomes contaminated during a manufacturing or recovery process. This point was clearly brought out when a considerable quantity of an alcoholic solution of hydrogen chloride was distilled. In the final rectification, samples of the alcohol were taken at intervals and none of these samples responded to the silver nitrate test for chlorides. These samples were combined and used as an anti-freeze in two automobiles. The owners of both machines very soon had to purchase new radiators for their cars. Chlorides have also been found to corrode silver very rapidly in alcoholic solutions.

Because of its high solvent action on organic materials, care has to be taken in bringing alcohol into contact with organic substances, not necessarily because it will corrode or dissolve them to a dangerous extent, but mainly to avoid contamination of the alcohol by its acquiring objectionable odors or color. Certain denatured alcohols, however, may be shipped in wooden barrels which are generally "glue-lined." Another common instance of the action of alcohol on organic materials is its effect on car finishes, and in dissolving protective coatings from aluminum containers. For many years, beginning about 1919, the greatest single outlet for ethyl alcohol was an anti-freeze for automobile radiators; and at first this protective product consisted simply of relatively pure alcohol appropriately denatured. It soon became apparent, however, that the commercial grades of completely denatured alcohol had pronounced corrosive action toward most of the metals used in automotive cooling systems, especially iron and solder. The seriousness of this situation led to a study, begun many years ago, of methods of controlling corrosion caused by coolants. This work developed along at least two lines, the use of somewhat purer alcohol and the addition thereto of specific substances to minimize or completely inhibit the corrosive action. The results so obtained have naturally been extended to include other substances used as anti-freeze, including methanol, glycerin and the glycols, with the result that today all reputable manufacturers of anti-freeze solutions are able to offer their customers a product with little or no damaging effect on automobile cooling systems.

Thus, the problem of corrosion by ethyl alcohol almost becomes the problem of corrosion by denaturants. These at present are approximately 100 in number, and they include such diverse substances as iodine, sulphuric acid, brucine, several ketones, several aldehydes, various esters, acetic acid, many essential oils, benzene, and complex mixtures such as those obtained by the destructive oxidation of certain petroleum fractions, or from certain cuts of liquids obtained by the destructive distillation of wood. The end use of alcohol determines which formula is available to the purchaser, and thus the corrosion problems incurred by users of alcohol are based very largely on the formula or formulas involved, superimposed upon the normally insignificant corrosive properties of alcohol itself. The apparatus difficulties of an ester manufacturer using alcohol denatured with sulphuric acid are quite different from those of a pharmaceutical concern which employs alcohol denatured with acetone.

Then there is the further complication introduced by impurities. At present the major processes for obtaining industrial ethyl alcohol are the fermentation of sugars and the catalytic hydration of ethylene. Raw alcohol manufactured by either of these methods is decidely impure. The impurities in raw synthetic alcohol may consist of acids (including sulphuric and sulphurous), other alcohols, ethers, esters, aldehydes and possibly hydrocarbons. The impurities in fermentation alcohol may consist of more or less volatile compounds of the following classes: sulphur derivatives (sulphides and mercaptans), ethers, esters, aldehydes (like acrolein, acetaldehyde and crotonaldehyde), other alcohols and organic nitrogen derivatives.

Since regulations concerning the use of alcohol are so strict, users of this chemical are required to reveal to the government and to their source of supply the general features of the processes wherein the alcohol is to be used; thus it happens that the manufacturer of the alcohol is always in a position to give each customer personal advice as to any corrosion problems involved with each permissible formula for the project in hand.

Worthite

W. E. PRATT, *Worthington Pump and Machinery Corp., Harrison, N. J.*

Worthite pumps are used in numerous applications involving alcohol, although alcohol in itself is not con-

Corrosive fumes...



Salt air...





Hot air...



Moist air...

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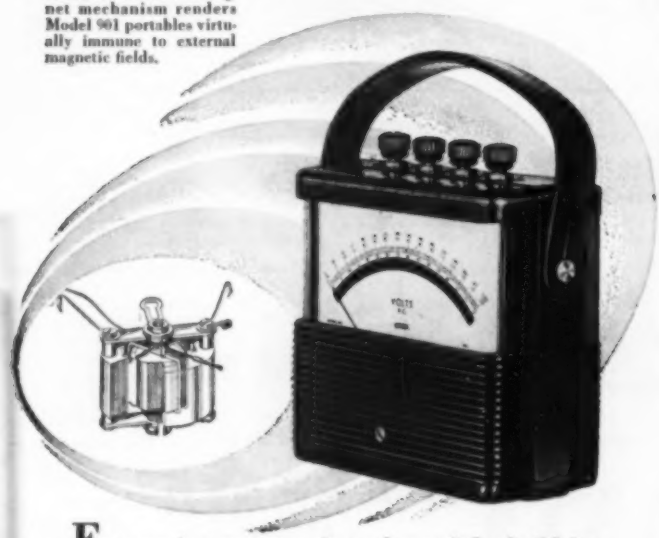
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CHEMICAL EXPOSITION, Nov. 26 to Dec. 1

WESTON *Instruments*

sidered as a corrosive agent requiring expensive alloys. In the drug and pharmaceutical industries which use Worthite pumps for alcohol and solutions containing alcohol, it is probable that Worthite pumps are used to insure freedom from contamination, as could occur from cast iron or bronze equipment. Worthite pumps handling alcohol and other solvents, with or without the presence of highly corrosive agents, are very frequently ordered with mechanical seals to prevent leakage from the stuffing box of a costly and sometimes a hazardous product. Such solvents are hard on ordinary packing and the cost of frequent repacking and replacement of scored shafts is eliminated by the use of a mechanical seal.

Where alcohol is used for solvent extraction, it may become contaminated with a corrosive agent. It is believed this explains the reasons for certain industries ordering Worthite pumps.

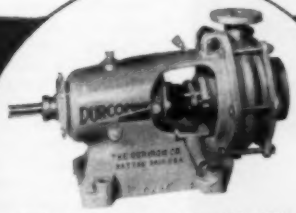
Alcohol is used as an additive to certain special lubricants and in processing, the product is treated with corrosive agents. Worthite pumps are known to be used in some of these processes. Alcohol mixtures with corrosive acids are encountered in plants using such mixtures and in some manufacturing processes. Dioxidine is a mixture of alcohol and phosphoric acid used for rust removal and metal cleaning. Worthite pumps circulate this solution for spraying on automobile bodies for cleaning prior to applying coatings. In a petroleum refinery and in a fine chemical manufacturing plant Worthite pumps are in use handling mixtures of alcohol and sulphuric acid. In another plant Worthite pumps are handling a mixture of 40 percent ethyl alcohol and salt water.

In an adhesive manufacturing plant Worthite ejectors are used where vapors being handled contain alcohol and acrylic esters The corrosive condition was sufficiently severe to warrant the use of Worthite over stainless steel.

Since grain alcohol is manufactured from both corn and other grains as well as from molasses, and since corn may be the starting point for manufacturing butanol and acetone with ethyl alcohol as a byproduct, it may be of interest to mention some uses of Worthite pumps in such plants. The corn kernels are first steeped in sulphurous acid which requires acid pumps for handling. Worthite is excellent for this service. Later in the process the starch is converted to dextrose prior to fermentation. In one plant the unconverted liquid is acidi-

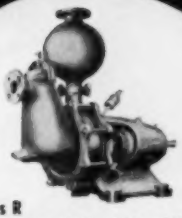
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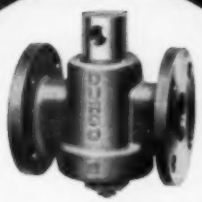
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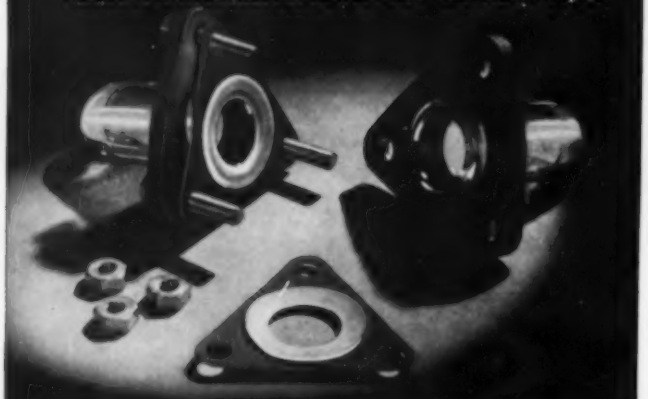
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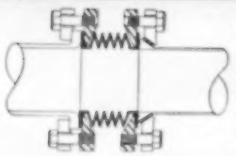
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CHEMISEAL

Gaskets & Accessories of TEFLON for Glass Pipe

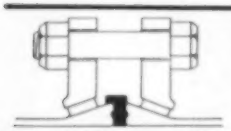


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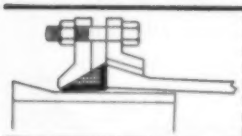


(Above:) **Chemiseal Jacketed Gaskets, Types T6N or T6-300 are standard for Corning conical flanges, seal at unusually low bolt load.**

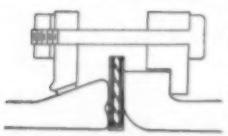
(At left:) **Chemiseal Expansion Joints, No. 212 for use where thermal expansion, vibration or misalignment requires a flexible pipe section. Sizes from 1 in. to 12 in. I.P.S.**



Chemiseal Snap-on type 820 Gaskets. Molded to match contour of conical-end glass pipe, they assure perfect, automatic centering of joints and free flow of materials. Made for all standard pipe sizes from ¼ in. to 6 in.



Chemiseal Jacketed Slip-Joint Gaskets (Teflon Jacketed Neoprene) provide positive, chemical-proof seals with low bolt loads. Made for standard pipe sizes from 1 in. to 6 in.



Chemiseal Adaptors No. 2-CRS, provide a tight, safe seal between glass coated steel or similar nozzles with large inside radii, and vessels of glass-lined steel, porcelain, Haveg, etc. A steel bearing ring provides rigidity. Resilient core assures perfect seal. The Teflon Jacket prevents chemical attack and contamination.

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fied with HCl and a 2-stage high pressure Worthite pump boosts the liquid into the dextrose converter. While Worthite is not suitable for use with HCl over a few percent concentration, for such weak solutions it does a really good job.

After the fermenters the alcohol is separated from the non-alcoholic substances in the "beer" still and the "stillage" from the still is processed to recover the solubles as cattle feed. Multi-effect evaporators are used for concentrating the stillage to a thick syrup (28-30 percent solids) after which it can be dried to solids of approximately 6-7 percent moisture in which form it makes a valuable and nutritive cattle food. A majority of the evaporators in use in the U. S. are fitted with Worthite transfer pumps.

In a large plant manufacturing alcohol and other solvents where 60 to 70 Worthite pumps are in use, the following solutions are pumped: niter alcohol, dinitro alcohols, alcohol and acetaldehyde, alcohol and water, catalyst. The majority of all the Worthite pumps are fitted with mechanical seals.

In one distillery, using molasses as the starting point, Worthite pumps and valves are used for the following services: ethyl alcohol slop, ethyl alcohol beer, heavy sirup 215 deg. F., 12 percent sirup 127 deg. F., contaminated condensate, thin grain stillage, concentrated distillery effluent, whiskey, concentrated H_2SO_4 for CO_2 drying tower under 100 psig., butyl acetate, and water.

In another distillery, all bronze pumps are being used for "grain mash" but Worthite pumps with mechanical seals are used for the final product—whiskey. Worthite pumps are now quite common for handling whiskey whereas 10 or 12 years ago such applications were unheard of. The obvious answer is a purer product and greater over-all economy.

Hastelloy

E. D. WEISERT, *Haynes Stellite Co., Kokomo, Ind.*

Hastelloy alloys A, B, C and D are resistant to the common alchols at all concentrations and temperatures. As in many other fields, Hastelloy alloys are used in the production of alcohol because of their ability to handle the strong process acids. For example, Hastelloy alloy D is widely used by the producers of ethanol and iso-propanol in the form of heating tubes for concentrating spent sulphuric acid used in the process.

Another application of the Hastelloy

alloys is the handling of alcohol-water mixtures in which the water phase contains process acids. Hastelloy alloy B pumps and piping are often used for handling such mixtures. Reaction columns for handling acidic water-alcohol mixtures have been given greater life economically by lining these reaction columns with Hastelloy alloy C.

Glass Lining

S. W. McCANN, *The Pfaudler Co., Rochester, N. Y.*

Glass lined steel is entirely resistant to alcohol at all concentrations and temperatures. Nearly all types and sizes of glass lined equipment have been used in various processes involving alcohol. Some complete distillation assemblies have been made for purifying alcohol that cannot tolerate any metallic salts. Large storage units have also been used to completely eliminate metallic contamination.

Coatings

KENNETH TATOR, *Kenneth Tator Associates, Coraopolis, Pa.*

When considering protective coatings and linings for handling and processing industrial alcohol, two factors are of significance: one, that industrial alcohol may be safely handled in iron and steel; and second, that a number of commonly used organic protective barriers are dissolved by alcohol.

In view of this first factor the use of a protective coating implies that another more corrosive material may be associated with the alcohol, and it is protection against the action of this material which is desired. Under these circumstances the active corrodant will determine the choice of the organic to be used, and the presence of alcohol will affect the decision only to insure that the selected lining will not be destroyed or impaired by alcohol exposure.

As lack of resistance of commonly used organic barriers to alcohol is due entirely to the solvating action of the alcohols it is safe to make the general statement that all of the non-polar materials will be resistant (such as the rubbers, natural or synthetic, hard or soft, polyethylene and its halogenated derivatives, chlorinated rubbers, polystyrenes, vinylidene chloride and bitumin hydrocarbons). Such resistances are characteristic only of the non-polar bases of course and if alcohol-susceptible material be used in the compounding or occur naturally as may be true of some bitumin compositions, leaching and color change may occur.

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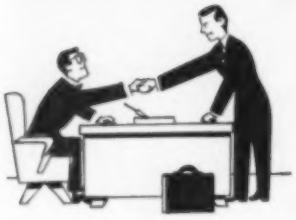
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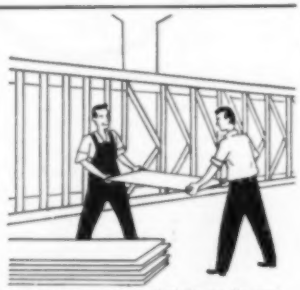
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Conversely the polar compounds will be unsuitable, such as unreacted phenolics or furanes, polyvinyl alcohols, and most of the cellulose esters.

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High-Silicon Irons

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

High-silicon irons are unaffected in the presence of the various alcohols at all temperatures and concentrations normally encountered. Tests conducted on the high-silicon iron, Duriron, in methyl alcohol and ethyl alcohol at temperatures up to 200 deg. F. showed no attack. Since the various alcohols in themselves do not impose a serious corrosion problem, other alloys less resistant than Duriron are usually selected for equipment used in the production and handling of these chemicals.

Duriron or Durichlor have been successfully applied in corrosive solutions where alcohol is handled in combination with other more corrosive chemicals such as the mineral acids. For instance, a Duriron pump has given long, trouble-free service in handling a chromic acid solution containing various percentages of ethyl alcohol, acetic acid, carbon tetrachloride, and acetone. Another high-silicon iron pump (Durichlor) is used in the alternate handling of alcohol and hydrochloric acid with excellent service after many years' use. The various alcohols themselves do not increase the corrosive nature of the particular mixture. However, since Duriron and Durichlor are not recommended for handling hydrofluoric, hydrofluosilicic and sulphurous acids, alcohol in combination with these acids should be avoided. For a more lengthy discussion pertaining to the resistance of the high-silicon irons to commonly encountered corrosives the reader should consult the other forums in this present series.

Durimet 20

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

For most plant conditions encountered in the production and handling of alcohol, the conventional 18-8-S stainless steels, copper, and brass are satisfactory materials of construction and are normally used. However,

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This huge steel monument looks out over seven counties in Pennsylvania, Ohio and West Virginia. The cross is the fulfillment of a dream of Reverend W. L. Hogg, D. D., of Uniontown. The man swinging in the sky is spraying it with a white Insul-Mastic coating to beautify and to prevent rusting.

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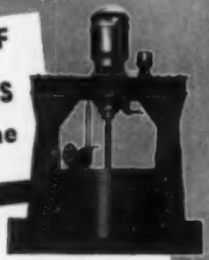
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where conditions are more severe, such as in the handling of other corrosives in combination with alcohol, Durimet 20 can be economically applied. Sulphuric acid, phosphoric acid and many other corrosives fall into this category. As indicated, the various alcohols are not corrosive in themselves, and will not alter the normal recommendations made for the Durimet alloy.

Tests conducted on Durimet 20 in methyl alcohol and ethyl alcohol solutions at temperatures up to 200 deg. F. indicate that it is virtually immune to attack. It also showed an extremely low rate of corrosion in a methyl alcohol-formaldehyde solution containing a small percentage of formic acid at a temperature of approximately 120 deg. F. A corrosion rate less than 1 mil per year was obtained on a butanol-water mixture containing 15 percent sodium chloride and highly acidified with sulphuric acid. This rate was many times lower than any of the 12 other alloys tested with the exception of Chlorimet 3.

Rubber

O. S. TRUE, *United States Rubber Co., New York, N. Y.*

Natural rubber compounds, both hard and soft, are only slightly affected by ethyl and methyl alcohol at temperatures up to the boiling point of the solution. Buna-N types, butyl, neoprene and Thiokol compositions may also be used in the presence of alcohols.

We have no commercial demand for rubber linings to handle alcohols as such. In certain instances alcohols have been present as impurities. In services where alcohols have been present as impurities, natural rubber linings have been successfully used in a good many cases.

Chlorimets

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

Chlorimet 2 and Chlorimet 3 exhibit no attack in the presence of the various alcohols even at elevated temperatures. Tests on these alloys in methyl alcohol and ethyl alcohol solutions at temperatures up to 200 deg. F. are the basis for this statement.

As pointed out in the discussions on the high-silicon irons and Durimet 20, superior corrosion resistant alloys are not normally considered economical for handling pure alcohol. The Chlorimets fall into this category. However, there are many severe services involving the presence of other destructive

chemicals in addition to the alcohol which necessitate the use of the Chlorimet alloys. For instance, a Chlorimet 3 pump is used for recirculating lauryl alcohol through a reactor where chlorine is injected to produce chlorinated alcohol at temperatures up to 325 deg. F. Chlorimet 2 has also found application for handling the resulting chlorinated alcohol where the presence of small amounts of hydrochloric acid necessitate a superior alloy. Another typical example involved the use of a number of Chlorimet 3 pumps for handling a mixture of 98 percent sulphuric acid and an alcohol during a sulphonation process. Excellent service is reported after three years' continuous handling of this corrosive by these pumps.

Cements

RAYMOND B. SEYMOUR, *The Atlas Mineral Products Co., Mertztown, Pa.*

Cements based on polymers of furfuryl alcohol, phenol, plasticized sulphur and sodium silicate are resistant to industrial alcohol in all concentrations. Furfuryl alcohol type cements are usually recommended for jointing tile and brick in floors in food, pharmaceutical and other plants where the exposure is primarily industrial alcohol.

Iron and Steel

A. W. SPITZ, *Henry Bower Mfg. Co., Philadelphia, Pa.*

Cast iron and steel are extensively used for tanks, pumps, and pipe lines handling methyl, ethyl, butyl, amyl alcohol, glycerine and glycols. Satisfactory equipment life can usually be expected. However, alcohol and water solutions, in the presence of air, may cause excessive corrosion, as may the presence of small amounts of organic acids. In some instances, slight contamination and discoloration may occur; high purity glycerine, for example, is usually stored in more resistant materials when color is an important consideration.

Nickel and Nickel Alloys

W. Z. FRIEND, *International Nickel Co., New York, N. Y.*

Nickel, Monel and Inconel usually are highly resistant to all of the alcohols including the higher alcohols, even at elevated temperatures. The Ni-Resist alloys, with the exception of the stainless variety, Type 5, may be subject to superficial rusting in water solutions of the alcohols, but actual corrosion rate of all of these alloys usually is very low. Many of the appli-

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SOLUTION:

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In the Arbuckle Mountains, limestone deposits have a combined thickness of about 8,000 feet (if the dolomites are included). Physically, Oklahoma limestones range from friable or chalky to stone with maximum crushing strength; from coarsely crystalline to very fine-grained; and from minutely oolitic to coarsely pisolitic. Chemically, they range from impure stone suitable for woolrock to chemical grade.

Oklahoma limestone is being utilized extensively for many purposes. Its quality and availability merit consideration for a multitude of additional uses.

TYPICAL ANALYSIS
(26 feet)

	Percent
CaO	54.760
MgO	0.680
SiO_2	0.143
Fe_2O_3	0.074
Al_2O_3	0.174
P_2O_5	0.007
SO_3	0.008
Ignition loss	43.940
Total	99.786

Detailed information on Oklahoma's mineral resources is available on request, based on data by the Oklahoma Geological Survey. Map showing location of mineral deposits is also available.



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cations of nickel, Monel and Inconel in connection with alcohols are in the preparation and handling of alcoholic mixtures such as drugs, perfumes, hospital solutions or alcoholic beverages where it is desired to keep metallic contamination at a minimum. Other applications are in the reactions of alcohols with other chemicals, as in esterfications where the active corrosive may be an acid such as acetic or sulphuric. Monel, in particular, is used in esterifications for such equipment as reactors, heating coils, piping, and agitators as described previously in this magazine (Dec. 1946, p. 218). Other applications include distilling and condensing equipment in the recovery of alcohols by distillation from or with other solvents such as acetates and acetone in solvent recovery processes.

Monel and nickel are used to a considerable extent in the production of glycerine in soap and fatty acid plants. Nickel and nickel-clad steel find particular use for glycerine stills, evaporating coils, condensers and for pipelines handling the finished product.

Stainless Steel

W. G. RENSHAW, *Allegheny Ludlum Steel Corp., Brackenridge, Pa.*

The stainless steels are widely used in applications involving alcohol, both in the industrial alcohol field where chemical purity of the product is essential and in the beverage industries where strict sanitation and cleanliness requirements must be observed. A wide number of compounds come under the classification of alcohol, but most important is ethyl alcohol and in this field stainless steel has been satisfactory in numerous applications involving this corrosive.

Stainless steel grades in the 300 series (chromium nickel) and in the 400 series (straight chromium) can handle the alcohols at almost all temperatures. Type 304 (0.08 max. C, 18-20 Cr, 8-10 Ni) is probably most commonly used alloy for such applications.

At elevated temperatures and boiling, methyl alcohol tends to oxidize to formaldehyde or formic acid in the presence of air. In some instances pitting of Type 304 has been encountered at the air line with hot methyl alcohol. Type 316 (0.10 max. C, 16-18 Cr, 10-14 Ni, 2-3 Mo) offers better resistance to pitting in such cases.

In the manufacture of ethyl alcohol, rectifying stills, columns, heat exchangers, condensers and piping have been made of Type 304. Type 430 is often suitable for some of this equip-

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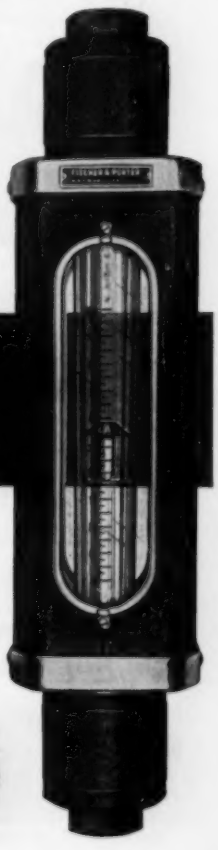
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ment. In the production of absolute alcohol the stainless steels are also useful except in instances where certain dehydrating agents such as zinc chloride might be used.

Type 304 is used extensively in the brewing and wine industries. Fermentation vats, rice cookers or mash tubs, storage vats and barrels of Type 304 are used in the brewing and transportation of beer. In wine industries, Type 304 and Type 316 have been frequently used. (Type 316 is more suitable where sulphur dioxide is present in the wines because this type offers considerably better resistance to pitting.)

Stainless steel is not affected by whiskey, but in some instances whiskey has become cloudy when stored in stainless steel, probably due to some catalytic effect of the metal. Stainless steel is rarely used in this particular application.

Tantalum

LEONARD R. SCRIBNER, *Fansteel Metallurgical Corp., North Chicago, Ill.*

So far as it is known, tantalum is inert to all alcohols, esters, aldehydes and ketones at all concentrations and temperatures at which it has been tested or used. Other metals less valuable than tantalum appear to be sufficiently satisfactory, however, so that there are few, if any, applications where tantalum need be considered in corrosion problems where alcohol alone is involved.

When alcohol is mixed with acids, however, problems of corrosion or product contamination become more difficult, and sometimes the use of tantalum becomes necessary. One possible instance is where sulphuric acid is used to dehydrate alcohols, where tantalum heaters and condensers can be used in the distillation operations, also to concentrate the acid for re-use.

In food and pharmaceutical processes, there are numerous applications where contamination, taste or odor can be traced to attack on process equipment by alcohols mixed with acids. In practically all such instances, the use of tantalum at the correct trouble spot is an effective and permanent remedy.

Carbon and Graphite

J. F. REVILOCK, *National Carbon Co., Cleveland, Ohio*

Carbon, graphite and impervious carbon and graphite materials have been proved satisfactory and chemically resistant by laboratory tests and

commercial applications to all concentrations of ethyl alcohol at all temperatures generally known to exist in industrial processes involving the alcohol. Carbon and graphite are not limited by temperature providing oxidants are not present at the specific temperatures involved. Impervious carbon and graphite materials are limited to processing temperatures up to 340 deg. F.; however, the material may be used in higher temperature applications when means to keep the body of the material below 340 deg. F. are provided.

These materials are also being used successfully in commercial installations involving methyl, isopropyl and butyl alcohols; laboratory tests have demonstrated that carbon, graphite, and impervious carbon and graphite are chemically resistant to amyl, octyl, and other aliphatic alcohols. In some services, the alcohols, particularly ethyl alcohol, are in combination with chlorinated hydrocarbons, chlorine, sulphuric acid, hydrochloric acid and caustic which results in corrosive conditions much more severe than the alcohols alone. Mechanical corrosion due to aeration or high fluid velocities has had no effect on carbon, graphite or impervious carbon and graphite equipment in the industrial applications involving the above mentioned alcohols.

The largest use of impervious carbon and graphite equipment in connection with alcohol has been in alcohol chlorination processes, and extensive tests both in the laboratory and in the field have established excellent service life in these processes.

Impervious graphite bubble cap trays, up to 5½ ft. dia., complete with caps, chimneys and downcomers, have been in use for several years in the stripping and scrubbing phases of the concentrated sulphuric acid process for the production of ethyl alcohol from ethylene. In the stripping column, the impervious graphite trays are in contact with ethyl alcohol, ether, both in the liquid and vapor phases, and approximately 50 percent sulphuric acid at temperatures varying from 150 deg. F. to 230 deg. F. The trays in the scrubbing tower are in contact with dilute caustic (1-10 percent) and crude alcohol vapor at a temperature of 212 deg. F. Also in the caustic scrubber, the lining is fabricated from graphite slabs. Other bubble cap trays are operating satisfactorily in the stripping tower of a process similar to that mentioned above, for the production of tertiary butyl alcohol.

Because of its excellent heat transfer properties, impervious graphite is fabricated into a variety of heat exchanging equipment for use in processes in-

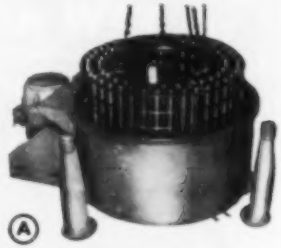


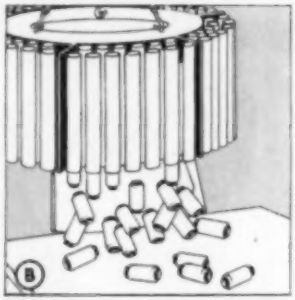
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It is incorporated in a link-suspended type AT&M centrifugal, in which a specially designed link guarantees minimum vibration in the foundation, uniform load distribution on the links and smooth operation with "out-of-balance" loads. Optional features include: fume-tight covers for volatile liquids, spray pipes, exhauster connections or removable baskets. Drives are direct-connected or clutch-operated. Speed lock prevents opening of cover until machine is at full stop.





(A) The new AT&M carrier, illustrated, is loaded conventionally, through the top. (B) Unloading is effected through a six-segment trap door in the bottom, eliminating all handling or tipping, reducing the time and trouble of unloading to a minimum, and enabling more cycles per shift.



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volving the alcohols mentioned above or their derivatives, particularly the chlorinated derivatives. The types of exchangers used most frequently are: the shell and tube type, the cascade type, the concentric type with steel or impervious graphite outer jacket, and the bayonet type. Several thousand square feet of impervious graphite tube bundle condensers are in service as reflux condensers on alcohol chlorinating reactors and as total condensers for chloral in the production of DDT. The construction and operation of these condensers are quite varied to suit the particular modification of the chloral production process developed by the various DDT manufacturers.

In the stripping phase of the ethylene to ethyl alcohol process, impervious graphite tube bundle exchangers are being used in calandria type boilers for the evaporation of the alcohol and ether from the water solution of sulphuric acid. The shell side is rated for 50 psi. steam. The other types of exchangers are being operated as condensers, heaters, and coolers, in a variety of applications involving butanol, isopropanol and higher molecular weight alcohols.

Impervious graphite pipe and pipe fittings, globe valves, and centrifugal pumps are used in the conveying systems of various industrial processes using ethyl alcohol and its derivatives. A particularly interesting application is the use of a centrifugal pump as a mixer reactor for the production of chloral. In this application the chlorine is injected into the alcohol stream just prior to the suction of the pump and consequently a thorough dispersion of the chlorine throughout the alcohol is obtained by the turbulent action inside of the pump.

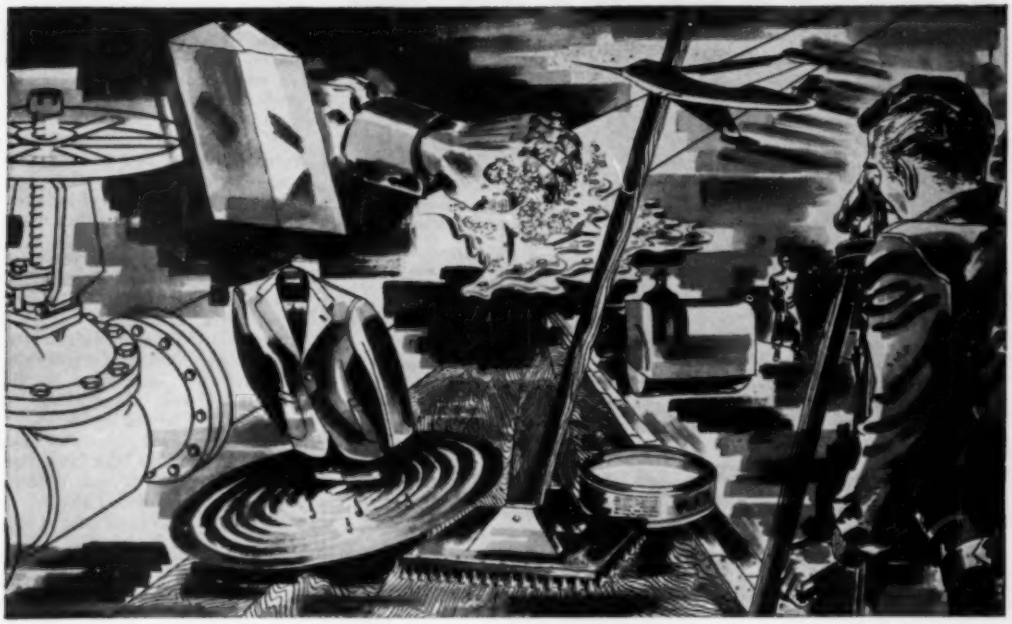
Porous carbon diffusers or perforated pipe diffusers are being used successfully in connection with alcohol chlorinating processes. Other porous carbon diffusers have found use in stripping butyl alcohol from heavier organic liquids by bubbling air through the mixture.

Aluminum

J. P. BALASH *and* E. D. VERINK, JR., *Aluminum Company of America, New Kensington, Pa.*

Aluminum alloys are eminently suited for service with most of the commercial alcohols. Chemical equipment and shipping containers made of aluminum are extensively employed for industrial and beverage alcohols. At room temperature, commercial alcohols, such as methyl, ethyl, propyl,

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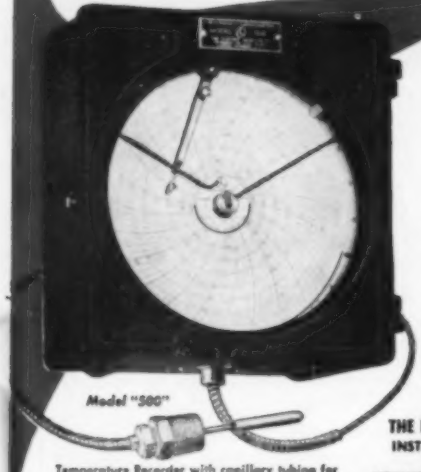
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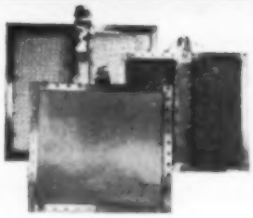
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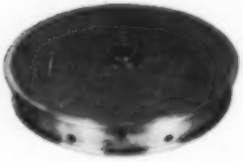
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butyl, etc., are substantially without effect on aluminum. At elevated temperatures, aluminum is normally suitable provided a trace of moisture is present. Even those alcohols which contain heavy metals on other contaminants generally can be successfully handled in aluminum by the addition of an inhibitor, such as sodium chromate. Aluminum stills, heat exchangers, piping, tankage, and shipping containers have given long service with a variety of alcohols and products employing alcohol in their manufacture.

In addition to corrosion resistance, ease of fabrication and erection, aluminum alloy storage tanks, piping, stills, filters, condensers, condenser tubing, and shipping containers often have special advantages for processing such materials. Aluminum is nonsparking and does not stimulate decomposition of organic liquids.

An all-aluminum reflux condenser built of 2S alloy has been in continuous service for over 16 years condensing a 90 percent methyl alcohol, 10 percent formaldehyde mixture at temperatures around 50 deg. C.

Aluminum alloys may be employed for alcohols produced both by the grain fermentation process and petroleum gas synthesis. For fermentation processes, aluminum has the advantage that it is non-toxic to living organisms, which property has encouraged the use of aluminum for the production of citric and gluconic acids, penicillin and other antibiotics.

High purity products, such as perfumes containing alcohols, are normally handled and shipped in aluminum bottles or other containers. An aluminum still and pipe for handling 95 denatured alcohol have been in satisfactory use for over six years.

In the manufacture of plastics where clarity and absence of discoloration are of paramount importance, isopropyl alcohol is handled and stored in tanks fabricated of aluminum alloy 3S.

Aluminum alloys have found use in the alcoholic beverage industry where purity of product and ease of maintenance are important. For example, an aluminum gin still, piping, condenser, and condenser tubing have given satisfactory service for more than 14 years handling 155-165 proof material. Practically all types of brewery equipment, brew kettles, starters, fermenters, storage tanks, and government tanks have been used in the United States since 1934. In addition considerably more than 1,000,000 aluminum beer barrels are currently in service.

Aluminum alloys have long been considered a standard material of construction for tanks and tank cars handling glycerine produced from vegetable oils and fats. More recently, 36 aluminum tank cars were purchased for synthetic glycerine. Aluminum alloys protect the water white quality of this higher alcohol shipped in tank cars.

Silicones

J. A. McHard and Leon Van Volkinburg, *Dow Corning Corp., Midland, Mich.*

Silicone products are generally insoluble or only partly miscible in polar solvents. Such behavior is due largely to the hydrophobic nature of organo-silicon oxide polymers. Silicone treated surfaces, for example, are completely non-wetting to water or aqueous solutions. Similarly methanol and the polyalcohols have practically no solvent effect on silicone fluids, resins or rubbers.

The solubility of silicone products in polar organic solvents varies with the amount of water in the solvent, the temperature and the solvent itself. A small amount of water in the organic solvent materially inhibits solvent action. Heat increases the solubility of silicones in polar organic solvents. In general, miscibility increases as the molecular weight of the alcohol increases. In the production of alcoholic beverages silicone grease is an effective lubricant for the packing glands which protect the mash tanks from contamination during sterilization.

Test specimens of typical silicone resins exposed to anhydrous ethyl alcohol indicated a negligible effect at room temperatures but some solvent action at higher temperatures.

Silicone rubber resists ethyl alcohol well, particularly at room temperature. Some swelling is noted at higher temperatures but after drying, the samples regain their original shape and properties.

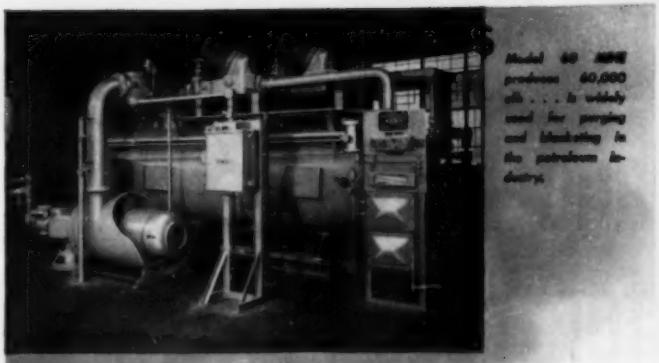
Lead

Kempton H. Roll, *Lead Industries Assn., New York, N. Y.*

From the engineering materials viewpoint, lead is not attacked by alcohol. However because alcohol is not considered in the category of corrosive chemicals, it generally has no occasion in the course of its manufacture to encounter lead directly.

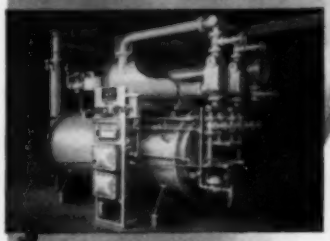
In the manufacture of those alcohols destined for human consumption, the use of lead in contact with the alcohol is not recommended.

—*End*

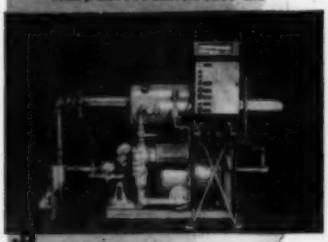


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KEMP Inert Gas Producers Can Save You up to 90% on Inert Gas Costs

Whether you now use bottled inerts or produce them with old-fashioned equipment, switch to a Kemp Inert Gas Generator and save 83% to 90% on your inert gas costs. Kemp Inert Gas Producers and Kemp Nitrogen Producers are available in standard models with capacities ranging from 500 to 200,000 cfh for fully automatic operation.

ABSOLUTELY DEPENDABLE

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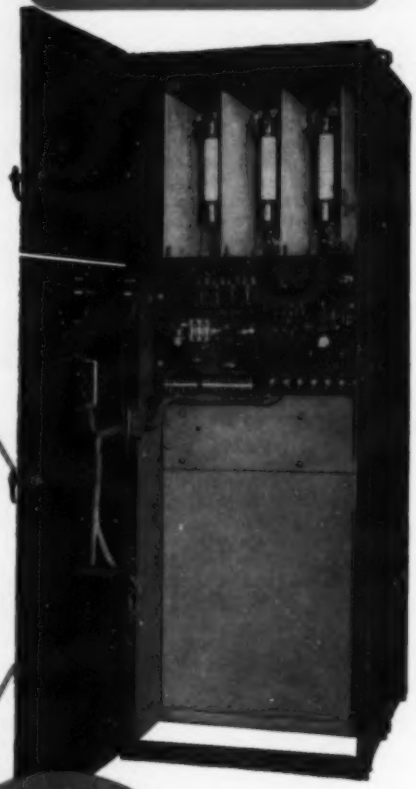
Write for Bulletin I-10 for technical information.
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Complete Control and Protection for Your Motors

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Type H Starters

FOR 2300 TO 5000 VOLT MOTORS



ONE ATTRACTIVE easy-to-install steel cabinet is all you need between line and motor when you specify Allis-Chalmers Type H Starters. Contactors, protective devices, meters, relays . . . everything you need for complete control and protection of your motors is built into Type H Starters. You get:

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2 **Overload Protection . . . Thermal relays have compensating elements — automatically adjust for ambient temperatures — trip on motor overload only.**

3 **Safe, Accessible Cubicle . . . upper front compartment encloses disconnect type fuses; lower front compartment, the low voltage control devices; rear compartment, the high voltage equipment.**

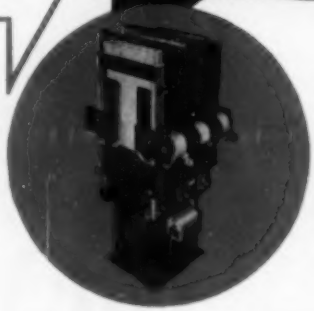
4 **Easy Installation . . . single steel enclosure is easy to handle, internal wiring is complete, wiring terminals accessible, easy to connect.**

5 **Personnel Protection . . . high voltage fuse compartment has electrical interlock.**

6 **Meters, Push Buttons, Recording Instruments, Rheostats, and similar devices you may need are mounted on the door of the low voltage compartment.**

Other features include undervoltage protection . . . and your choice of either air break or oil immersed contactors — whichever is best for your application.

For motor control that is engineered to your job, specify Allis-Chalmers Type H Starters for motors with ratings up to 2500 hp. Call your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 14B6410A.



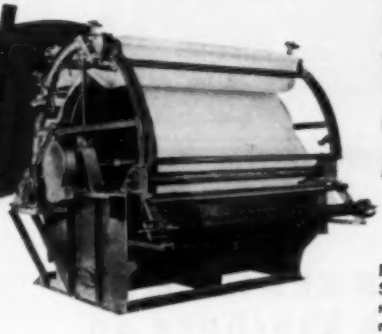
Specify Type 256 Air Break Contactor, shown, for tough, repetitive duty, longer contact life . . . Type MO Oil Immersed Contactor for normal starting duty or for service in dust laden, corrosive or very moist atmospheres.

A-3289

ALLIS-CHALMERS

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39

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*Patented Alloy

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Figure 2125 Double-Wedge Disc Rising Stem



Figure 2127 Solid-Wedge Disc Rising Stem



Figure 2129 Single-Wedge Disc Non-Rising Stem

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SIX INDIVIDUALS: Are they basically alike?

Engineers: Much in Common?

We don't believe the "typical engineer" exists any more than the "average man" does. But certain patterns do emerge from the group, patterns that may fit you.

Maybe that chap sitting next to you at that last Institute meeting measured about 5 ft. 11 in., wore glasses, was married, had two children, counted himself ambitious and fairly successful —and maybe he was a short bachelor who wasn't quite sure how or why he ever got mixed up with differential equations.

Two social scientists have made a study of a random sampling of engineers,* trying to find out how they think; how and why they react in a given way to a given situation. We neither agree nor disagree, nor do we ask you to. We think the results are interesting and for that reason we present a bird's-eye view of them below.

The authors of the study chose men who had had at least four years experience. They were all satisfied with their work. A bachelor's degree was required of the engineers under surveillance as well as a minimum salary of $4,200. It was also required that the men be engaged solely in engineering and not administration.

Findings indicated that the average age of the established successful engineer studied was 37, his salary $8,000. Above him were the men from 37 to 43 years who averaged $10,000. Below him, the engineers in the 30 to 36 bracket earned an annual $6,500.

Practically all of the men were married, and these averaged two children each. The study also indicated that the engineer is apt to be a big man, about 5 ft. 11 in., and has more than a 50-50 chance of wearing glasses.

Practically all the engineers demonstrated superior to very superior intelligence, had been excellent students, and were very ambitious in their work, most aiming at an eventual salary of $15,000 or more per year.

But of greater interest, to us at least, were the generalizations these researchers had made of the personalities of the engineers they studied. The Henry-Moore Test of Thematic Production was used (stories told to a standard set of pictures are analyzed for personality structure). Results are paraphrased below.

The engineer is a practical thinker; his approach to a problem is along the concrete, factual line with the emphasis placed on the facts rather than on the abstract intellectual or intangible human possibilities. In solving a problem, he quickly turns to techniques and methods, with an implicit assumption that there is an actual mechanical relationship between any beginning and any end. The salesman, on the other hand, is more likely to try persuasion and other influences. He relies on feelings rather than on levers to accomplish his goal.

The test group indicated that engineers are not only practical but most of them show a tendency to limit their attention to immediate matters, and not to think far beyond the next step. When one is realistic and dealing with scientifically predictable processes, this will not get a man into trouble. That doesn't hold, of course, when there are unpredictable and intangible matters involved. The advantage in this type of mind is that it enables a man to get personal satisfaction out of his particular, everyday duties and achievements. The danger is that the engineer may fail to recognize a problem of large ramifications and subtle complexity when such a problem comes his way.

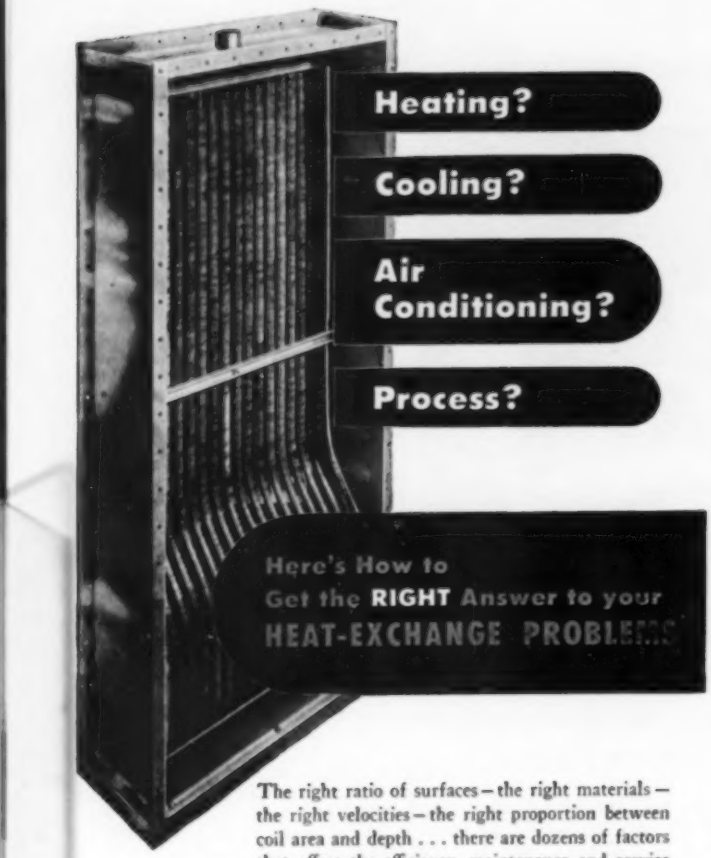
These characteristics, when sufficiently marked, can be detrimental to promotion to top management.

They then become impractical simply because they are so down-to-earth. The substance of policy formation is often abstract, and the factors to consider in solving a problem are sometimes not just intangible but even unknowable.

In personal relations, too, exaggerations of these attitudes of the "typical" engineer can lead him to oversimplify—to work in black and white when trying to reproduce a sunset—to condemn and praise "on principle," and on pure precedent.

Did these engineers like to be "bossed"? No. These men feel comfortable when they are given relatively little supervision. They would be quick to criticize any policy that was inimical to their own interests. As a group they are resentful of close, authoritative control. They expect to be regarded as competent and responsible people, and to be allowed to carry out their responsibilities without continual interruption.

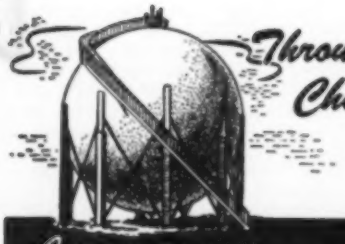
Are these engineers likely to make good supervisors themselves? The engineer does not forget authority in his relations either up or down the line. He looks up to his superiors, and he candidly expects to be looked up to in turn. He is likely to have some trouble in delegating authority to people be-



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neath him. His unexpressed attitude is that the work for which he is responsible is his, and as a result he may unconsciously try to de-skill or mechanize his subordinates' work so that they cannot make errors without his knowledge.

He is essentially an authoritative person. He sets high standards, gives precise and orderly directions, supervises and checks quite systematically. When the work load can be handled in such a systematic—almost mechanical—way, he gets along very well, and the men in our group would, by and large, be very well liked by subordinates. When problems arise that cannot be handled by impersonal regulations or procedures, however, the engineer is likely to try to handle them that way anyway. He may try to force work orientation on employees disgruntled by their feelings, not their duties. He may try to use the formal pressures of the job—money, production, firing—to suppress or solve problems of competition, clique conflicts, personal unhappiness, and so on. He often has difficulty with "disciplinary" action just because he believes that it is either a "practical" difficulty or a character fault.

What are some personal characteristics? The men in this group of successful engineers are strongly work oriented, and they prefer objects and processes to either people or ideas. In work motivation this same cluster of attitudes appears—they value concrete rewards and material gain more than do executives and some other professionals. In these productive men, there is usually a balance provided by their strong sense of responsibility, so that we find not mercenaries, but men who want concrete returns, and are willing to work for them.

The realistic engineer tends to have less use for feelings and imagination than he has for mechanical and physical reality. He therefore discourages himself in those areas—just as he expects others to do. One result has been indirectly mentioned; instead of being creative he is likely to be ingenious. Instead of being innovative, his is resourceful. Another, more intimate result is highly important. He is tense.

Emotions which rise are ignored, suppressed and repressed unless they are so intense that they overwhelm his self-control (which is usually pretty strong). Feelings are regarded as invalid phenomena, not to be taken into account when deciding what job to take, whom to hire. These feelings are ignored just as they are ignored when deciding whether a certain proc-



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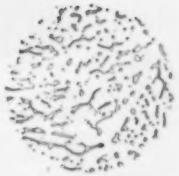
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ESCO pipe is centrifugally cast of corrosion resisting stainless steels. Pipes are joined with fittings cast of the same stainless analyses and designed for the individual layout. Pipe and fittings are flanged or welded together, heat treated to assure maximum effectiveness in resisting corrosion, and then pressure tested.

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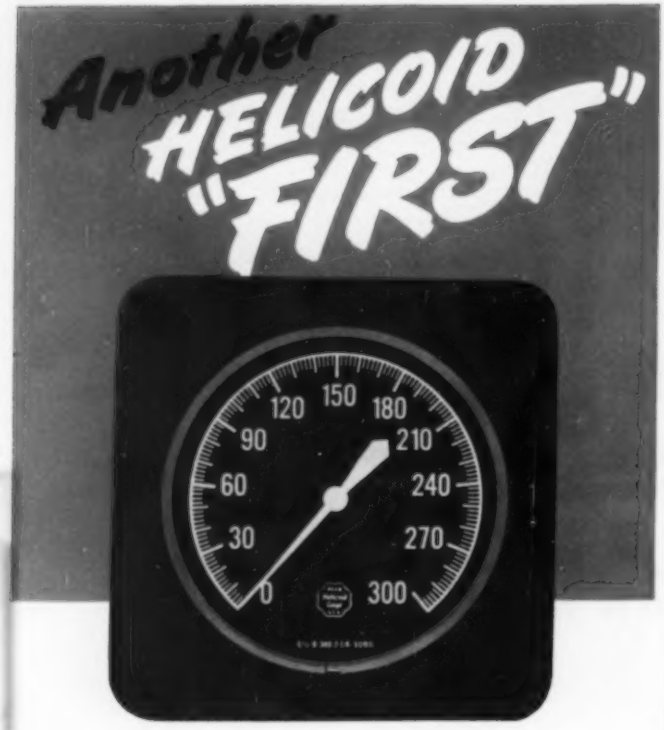
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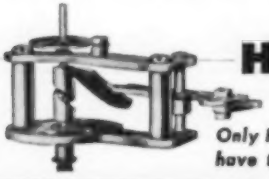
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ess will be economical or what effect a higher firing temperature might have.

Unrecognized, unnoticed and unexpressed, these feelings and imaginings come out indirectly, in "temperamental" ways that persist and affect behavior, or in physiological disturbances. Irritation is one of the most common expressions of the tension in engineers. This occurs in anyone who suppresses or denies his emotions until they approach the overflowing stage. In some of the engineers in our group, it could be said to be characteristic, so readily did they show it. One technique of getting rid of tension which is frequently used by these men is hard work—working until fatigue makes it impossible to feel any longer.

Here the resentment of overwork, the frustration of having been passed up by competition or favoritism, the irritation with employees who do not have comparable knowledge, can be worked out with physical motion. This is a sound expedient—it drains off the physiological effects of emotion and so enables the man to be comfortable. Here the difficulty is that it does not build up understanding or skill for solving the problem next time; it does not teach anything at all.

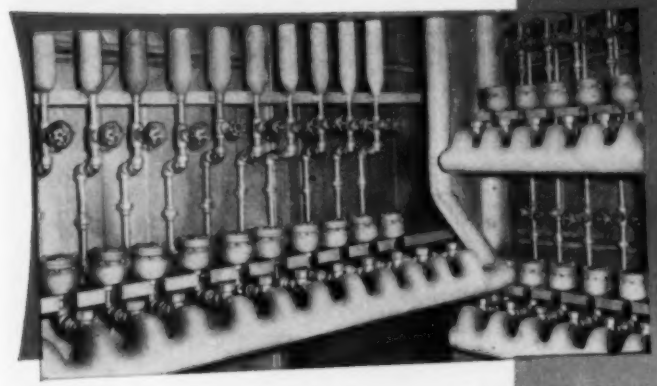
In general, the engineers are strong people with high standards and social ethics. They are intolerant of failure, and tend to censure people who "allow" themselves to fail or be inadequate. It should be noted that just this disapproval of failure is often a contributing factor in their tension—the possibility of failure is an abhorrent, but still a real fact. Although they share this fear of failure with many others in the industrial world, it seems to be a bit stronger in the engineering profession than it is in some others—like professional administrators.

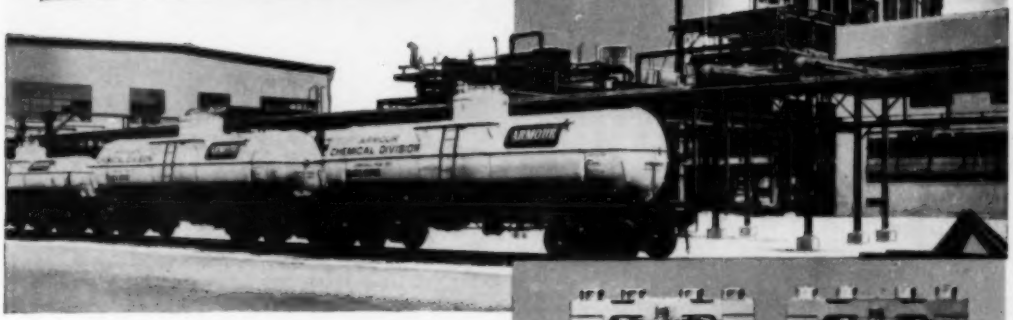
Similarly, their "ethical" behavior is sometimes built more on fear of censure than on comprehension of constructive values, and these men may show additional tension as well as occasional breakdowns under stress or heavy drinking. On the positive side, they are, by and large, constructive in values, in their influence on both social and business groups, and will undertake projects and responsibilities for the public welfare.

• This article is based on a study made by Harriet Bruce Moore, Director of Psychological Services for Social Research, Inc., and Sidney J. Levy of the same corporation. Complete results of the study were published in the September 1951 issue of *Personnel*. This article is based largely on that publication with permission of the American Management Assn. and the authors. —*End*

NICHOLSON TRAPS SELECTED

for Armour Chemical Plant





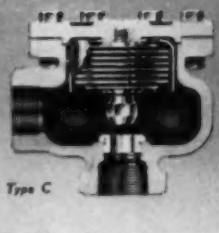
Above, new McCook, Ill., plant of Armour and Company's Chemical Division. Nicholson steam traps were specified throughout. Left above, a battery shown on tracer lines warming fatty acids.

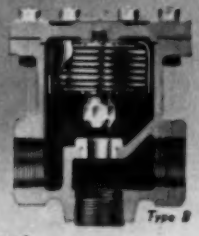
Many chemicals are made available in commercial quantities for the first time by this new Armour Chemical Division plant. With demands for process steam alone as high as 80,000 pounds per hour, the entire plant is equipped with Nicholson steam traps, both grounds and buildings.

Features of Nicholson thermostatic steam traps: 2 to 6 times average drainage capacity; shorten heat-up time. Operate at lower temperature differential; fast action keeps equipment full of live steam. Maximum air-venting capacity. Freeze-proof. Types for every process, power, heat application.

Send for NICHOLSON TRAP CATALOG 751

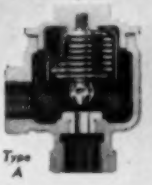
Catalog 751 contains capacity tables, installation diagrams, and data, charts and formulae for determining the proper size trap.

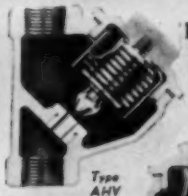




The two types above are cast iron; sizes ½" to 2"; pressures from vacuum to 225 lbs. Type C also in cast steel for pressures to 300 lbs.

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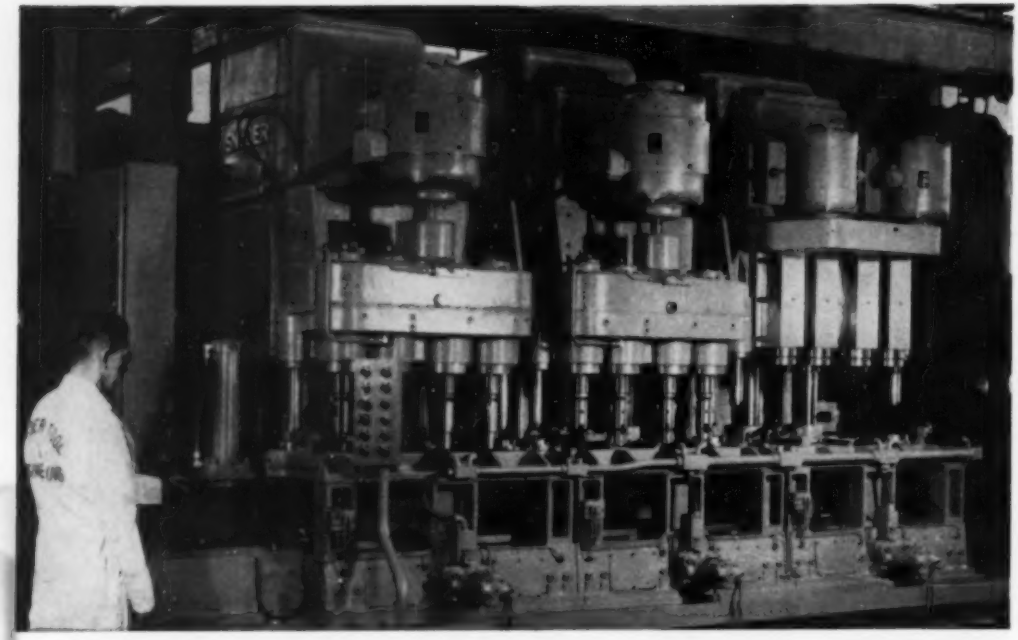


These three types are bronze; sizes ¼" to 1"; pressures from vacuum to 200 lbs. All 5 types have stainless steel valves and seats; bronze, monel or stainless steel bellows.

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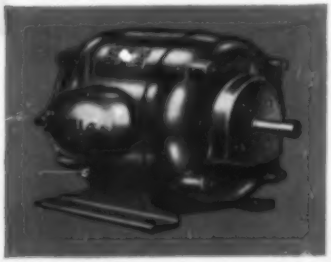
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Howell Type F Motor. A high slip, high torque motor designed for punching and boring operations. Sizes ½ to 200 H.P. in open frames; ½ to 125 H.P. in enclosed frames.



Howell Type SC, general purpose, protected-type Motor. Ideal for driving machines and equipment where atmosphere is moisture- or dust-free. Horizontal or vertical mounting.

This 7 station transfer-type boring machine was designed and built to replace *three* machines!

It rough bores, semi-finish bores and finish bores cylinder sleeves to exacting tolerances in one continuous, automatic operation.

Howell engineers worked closely with this manufacturer to provide the right type and size motor for each application. Two 15 H.P. and two 5 H.P. Howell Industrial Motors supply dependable power for the twelve boring spindles. A 7½ H.P. Howell motor operates each of the three hydraulic pumps which control the rough, semi-finish and finish heads. Each motor was engineered for its job!

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Our research facilities, engineering experience and manufacturing skill are at your service. May we help you?

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HOWELL Red Band MOTORS

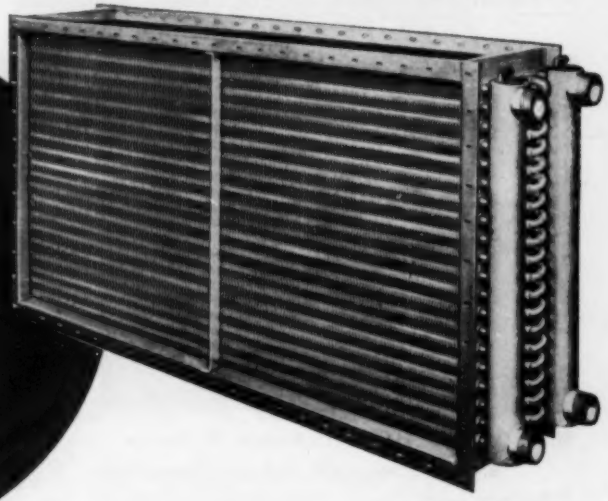
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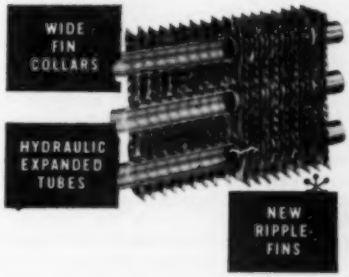


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Names in the News Edited by Frances Arne



MAN OF THE MONTH: Robert M. Burns

Winner of the 46th Perkin Medal is Bell Telephone Laboratories' chemical director, expert in the applications of chemistry to the communications industry, ex-Coloradian and life-long devotee of the great outdoors.

Asked how he felt about winning the Perkin Medal, Bob Burns, chemical director of Bell Telephone Laboratories, leaned back in his chair and smiled slowly.

"Well, I was surprised. It somehow never occurred to me that my job put me in the right category. I'd always thought of the medal going to someone more directly involved in putting out a chemical product. Of course, now that I look back, that hasn't been so at all."

Burns emphasized that he feels he shares the honor that goes with the medal with his whole staff at BTL.

Chemical Engineering's reporter caught up with the spruce, tweed-suited research administrator on one of his visits to the Laboratories' New York office. He spends most of his time in Murray Hill, N. J., where the company's chemical laboratories are now located. He finds his job exactly to his taste—in the relatively non-restrictive area between a research chemist and industrial executive.

As he sees it, his prime function is to pick top-notch researchers, then insure that they're given their heads. He likes associating with research men, likes clearing the way for their work.

Dr. Burns has been with Bell Laboratories since 1922, shortly after receiving his doctorate from Princeton. Most of his accomplishments, therefore, center around applications of chemistry to problems of the communications industry: control and prevention of corrosion; development of primary batteries, storage cells (cadmium lead) and electrolytic capacitors (using aluminum and tungsten); and artificial growth and utilization of large piezoelectric crystals for the control of electronic circuits. He has put his hand to solving metallurgical problems of the industry, particularly those of the metalloids and semi-conductors used in the highly valuable transistors for electronic circuits. The development of ceramic and high polymer (synthetic resin) insulating and structural materials and the development of methods and instrumental and micro-analysis have also received a large share of his time.

He is the senior author of the monograph "Protective Coatings for Metals." Another literary venture grew out of the enthusiastic part he takes in the work of professional societies. As secretary and editor of the Electrochemical Society in 1947, he was responsible for the establishment of the *Journal of the Electrochemical Society*. For the first time, technical contributions to the society were published monthly. He is a past president of the society and is now chairman of the publication committee. He has also been active in ACS, serving as chairman of its largest section, New York, during 1949-50.

On the fine October morning that we saw him, Dr. Burns had a button chrysanthemum in his lapel. "I grow these on my 'ranch' in Summit," he explained. "It covers an acre—and out in Colorado where I come from, we call an acre or over a ranch." His primary crops are edibles like tomatoes and strawberries and he tends them himself.

But mountain climbing is his first best love hobbywise. He comes by it naturally since, he points out, Colorado contains 54 of the nation's 61 mountain peaks. He was born in the state, spent his boyhood and undergraduate days there (University of Colorado), didn't leave until the Army called him in 1918.

When he finally settled in the New York area, he joined the Green Mountain and Appalachian Mountain clubs. He thinks Maine, Mt. Katahdin in particular, is the nearest the East can come to Colorado climbing.

"I used to miss the feeling of desolation you always find in the western mountains," he says. But he's learned to make even New Jersey trails fill the bill. In fact he suddenly realized recently that his roots in the East have grown so strong, he no longer wants to return to live in Colorado.

C. S. Fazel. Vice president, Solvay Process Division, Allied Chemical & Dye Corp. Formerly director of development for Solvay's nitrogen section, Hopewell, Va. His successor: **E. D. Crittenden,** formerly chief of research for the section. **E. W. Bowen:** from chief engineer to assistant director of development for the section.

Carv R. Wagner. Senior vice president General Aniline & Film Corp.; has been vice president in charge of operations. Prior to joining General Aniline in 1947, director of research for the Pure Oil Co. New vice president of operations, General Aniline Works: **John C. Franklin.** With General Dyestuff Corp. since 1949. Formerly manager of Oak Ridge operations of AEC.

Erwin Di Cyan. President, Association of Consulting Chemists and Chemical Engineers; consulting chemist with Di Cyan & Brown, New York. New vice president of the association: **Earl D. Stewart,** director of research at Schwarz Laboratories. Secretary: **William C. Bowen, Jr.,** technical director, Ledoux & Co. Treasurer: **Foster D. Snell,** president of Foster D. Snell, Inc.

Tom Moffitt. Works manager of the Hooker Electrochemical Co. plant at Tacoma, Wash. New plant engineer: **George Gentes.**

Roger B. Rice. From GE chemical division's new product development laboratory to the operations staff of Knolls Atomic Power Laboratory

Here's what we meant by

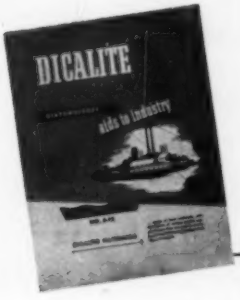
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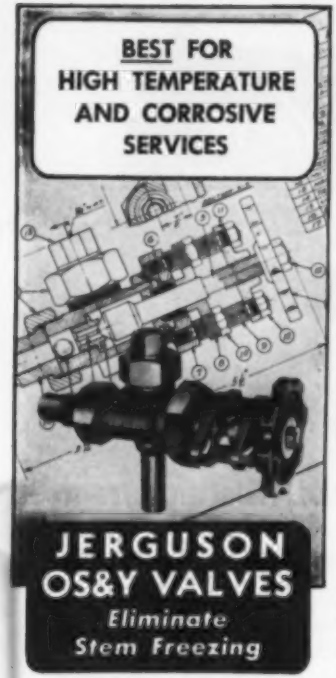
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NAMES IN THE NEWS, cont. . .

in Schenectady, N. Y. Joined GE in 1943 as a development chemist. Graduate of the University of Cincinnati.

Harrison Johnston. Manager of Ampex Electric Corp.'s newly created product engineering division. With General Electric Corp. since 1939. Princeton engineering graduate.



H. Johnston



G. W. McMillan

Graham W. McMillan. Manager of the newly created production development and quality control division of Commercial Solvents Corp. Joined the company's research department in 1940, transferred to production in 1946. Doctorate from the University of Illinois.

Robert L. Hatch. With the process development laboratory of GE's chemical division. For three years, a chemical engineer with Standard Oil (Indiana). Another addition to the laboratory staff: **Stanley Seltzer,** formerly a teaching fellow in the department of chemical and metallurgical engineering at the University of Michigan.

Harold Oatfield. Literature research chemist, chemical research and development department, Chas. Pfizer and Co. Formerly a professional associate in the division of medical sciences, National Research Council.

Paul W. Hiller. New York district manager of chemical sales for the potash division, International Minerals & Chemical Corp. Has been manager of the products development department of Innis, Speiden & Co., an International subsidiary, since 1948.

G. L. Glespen. Technical supervisor, petroleum chemicals department, American Cyanamid. Formerly supervisor of catalyst products at company headquarters in New York.

Robert K. Fincher. Assistant general manager, Memphis chemical plant, Quaker Oats Co. Joined the company as manager of the engineering department at the plant in 1946.

Frank H. Spedding. Winner of the 1952 William H. Nichols Medal of the New York section, ACS. Director of the Institute for Atomic Research at Iowa State College. Noted for his wartime role in the atomic energy development.

George N. Brunt. General manager, Southern Latex Corp., Austell, Ga. For 20 years with Flintkote Co., New York.

Raymond J. Karpen. Chief for a second term, sanitary engineering section, Army Medical Service Corps. Studied chemical engineering at the University of Minnesota.

Spencer H. Hellekson. Assistant manager, Savannah, Ga., plant of the Paper Makers Chemical Dept., Hercules Powder Co. Formerly superintendent of the department's Milwaukee, Wis., plant.

R. H. McCormac. Assistant to the vice president in charge of resin and chemical operations, American-Marietta Co. Since 1946, with Resinas Argentinas, Buenos Aires. Previously with Sherwin-Williams for 17 years.

Osgood V. Tracy. Deputy director, NPA's chemical division. On leave as general manager of the chemical products department, Esso Standard Oil Co. Formerly operations head of Standard Oil Development and manufacturing coordinator of chemical products for Esso Standard. Director of Enjay Co., a chemical products marketing affiliate of Esso. Mr. Tracy is the first oil industry representative to help direct NPA's chemical division.



O. V. Tracy



C. G. Kirkbride

Chalmer G. Kirkbride. To receive the 1951 Professional Progress Award in Chemical Engineering, sponsored by Celanese, administered by AIChE. Vice president and director of Houdry Process Corp. Chemical engineering graduate of the University of Michigan. Subsequently with Standard Oil of Indiana, assistant director of research

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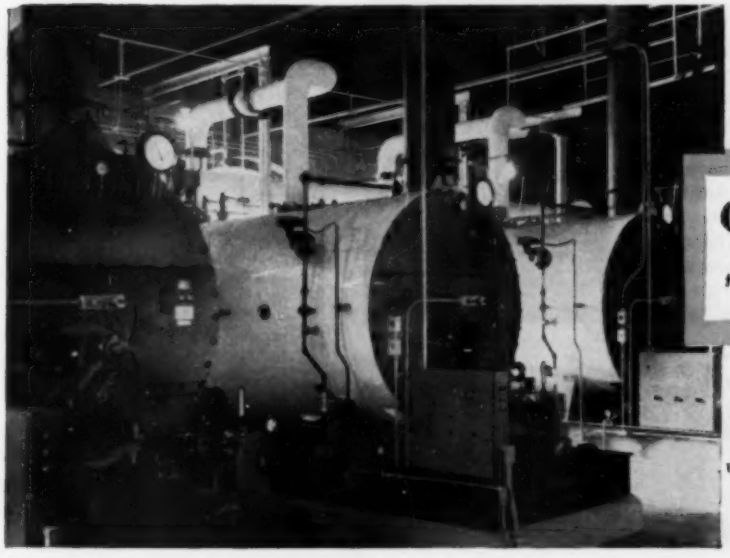
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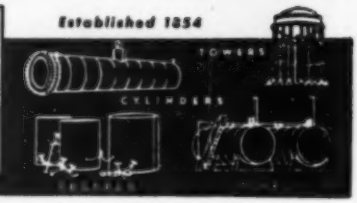
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NAMES IN THE NEWS, *cont. . .*

with Pan American Refining Corp., chief of chemical engineering development at Magnolia Petroleum Co., professor of chemical engineering at A & M College of Texas.

Harold L. Straube. Operations manager of John Powell & Co. Formerly general manager of John Powell Chemical Co., Huntsville, Ala., an affiliate of the parent company.



H. L. Straube



H. Reintjes

Harold Reintjes. Special assistant to the director of Godfrey L. Cabot's research and development department. Also new vice president and general manager of Petrocarb Equipment, Inc., a partly-owned Cabot subsidiary. Associate director of the Illinois research and development division of Great Lakes Carbon Corp. for the past five years. Graduate of Rose Polytechnic Institute.

Thomas G. Crane. Managing director of Monsanto Chemicals (Australia) Ltd. Has been deputy managing director. With Monsanto for 19 years, originally as assistant plant chemist at the Ruabon, England, works.

Robert L. Grun. Chief product engineer, industrial lubricants and specialties section, product development department, Gulf Oil Corp. With Gulf since 1936, most recently as chief fuels and lubricants engineer, process oil section, industrial products engineering. Graduate of Penn State.

Robert C. Becherer. Executive vice president, Link-Belt Co. Joined Link-Belt in 1923. General manager of the Ewart plant in Indianapolis since 1947. Chemical engineering graduate of Purdue. His successor at Ewart: **Richard E. Whinrey,** formerly assistant general manager there.

Walter H. Salzenberg. Assistant general manager, Du Pont's Grasselli Chemicals Dept. Departmental engineer since 1950. Joined Du Pont in 1929 as junior engineer at the Chambers Works. Lehigh graduate.

Bjarne Klaussen. Executive vice president, Hooker Electrochemical Co. Since 1947, vice president in charge of production for all Hooker plants. Job chronology with Hooker: joined in 1916 as a research chemist; head of fine chemicals department, shift superintendent, office manager, plant superintendent and works manager of the Niagara plant. New chief engineer of the company: **Donald E. Springer.** With the company since 1941 assigned to special projects among which was the design of the Hooker-Detrex plant at Ashtabula, Ohio.

Elwood V. White. Research associate and group leader in the field of carbohydrate chemistry for the Institute of Paper Chemistry. Previous positions: research chemist at Dow Chemical Co., 1936 to 1938; associate professor then professor, University of Idaho, 1938 to 1948; most recently, professor of chemistry at the University of British Columbia.

M. P. Etheredge. President, Southern Assn. of Science and Industry. Dean of science, Mississippi State College. Known for his work on agricultural chemicals.

Carl C. Monrad. Holder of a new professorship established at Carnegie Tech through a grant from Columbia-Southern Chemical Corp. Head of Carnegie Tech's department of chemical engineering since 1947. Consultant to the Office of Rubber Reserve of the RFC. Joined the Carnegie faculty as an associate professor of chemical engineering in 1937, full professor, 1942.



C. C. Monrad



A. M. Bond, Jr.

Allen McKee Bond, Jr. Manager of the fats and oils section, Votator Division, Girdler Corp. Joined the division's technical staff in 1946. Chemical engineering graduate of Purdue.

R. L. Nix. Chief fuels and lubricants engineer, process oil section, industrial products engineering, Gulf Oil Corp. Has been a member of the company's technical service group. With Gulf since 1940. New chief



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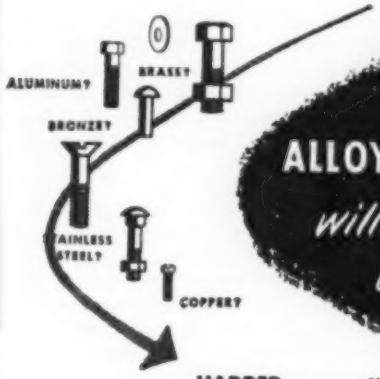
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product engineer, motor lubricants and additives section, product development department: **A. Lewis, Jr.** Since 1946, a member of the staff of Gulf Petroleum Fellowship at the Mellon Institute.

James L. Vaughn. Director of process engineering department, National Research Corp. Since 1947, design and development engineer for Rohm and Haas. Chemical engineering graduate of MIT. Subsequent employers: Standard Oil of New Jersey, Shell Chemical, Rhode Island State College.



J. L. Vaughn



S. O. Sorensen

Samuel O. Sorensen. New member of the board of directors of Archer-Daniels-Midland. Joined ADM as a chemist in 1923. Served as chief chemist, technical director, in 1947 was named vice president in charge of research.

Thomas R. Steadman. Member of the petrochemicals research department of National Research Corp. To supervise organic chemistry phases of a research program to develop new chemicals from natural gas. Has been an organic chemist with B. F. Goodrich in Brecksville, Ohio. Doctorate in organic chemistry from Harvard.

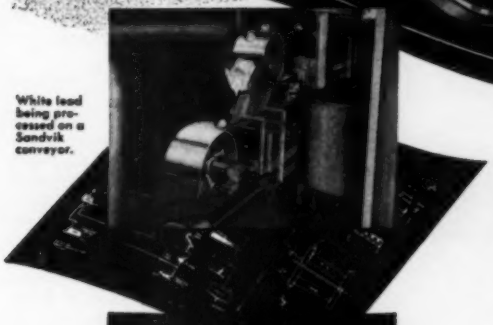
Robert T. Conner. Director of the research and development laboratories, Smith, Kline & French Laboratories. Previously technical assistant to the director of the laboratories.

Harold L. Maxwell. A vice president of ASTM. Supervisor of general consultants, E. I. du Pont de Nemours. From 1926 to 1930, associate professor of chemical engineering, Purdue; metallurgist for Du Pont's ammonia department, 1930 to 1933; then in charge of metallurgy, engineering department for 13 years. Doctorate in chemical engineering and metallurgy, 1924.

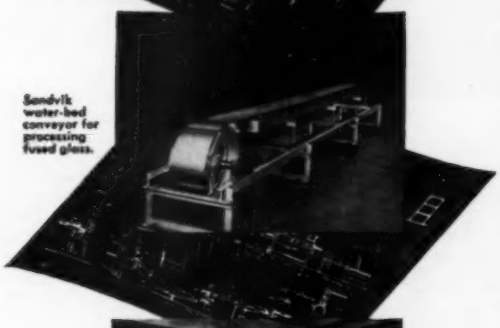
Fred Morton. Manager of the Pekin, Ill., plant, Corn Products Refining Co. His successor as manager of the

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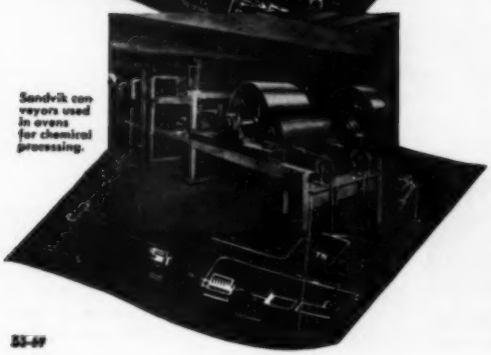




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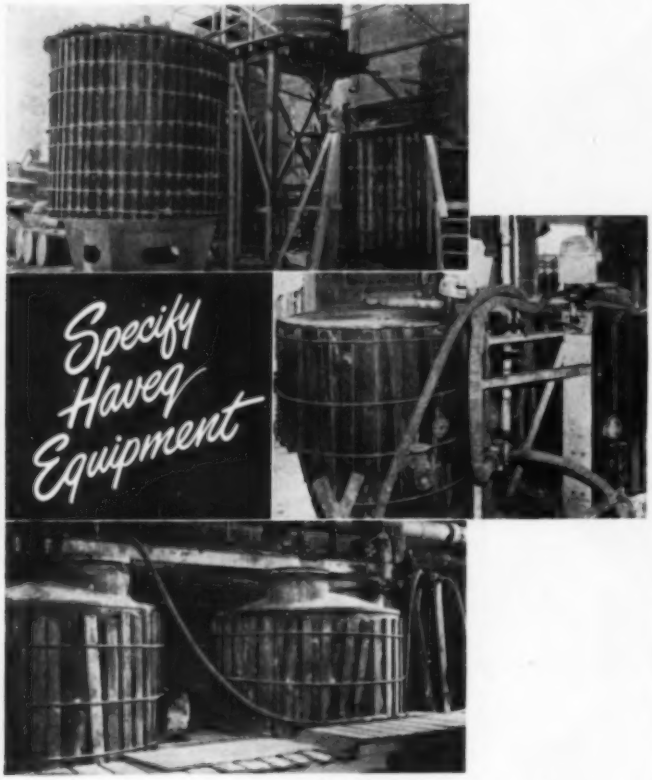
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company's Bluebonnet plant at Corpus Christi: **E. F. Schroeder.**

Malvern J. Hiler. From executive vice president to president, Commonwealth Engineering Co. of Ohio. Graduate of Michigan State Normal College. Subsequently, research chemist with Sharples Solvents Co., district sales manager of Sharples Chemicals, director of research and development at Stepan Chemical Co.



M. J. Hiler



J. R. Stevens

Joseph R. Stevens. A vice president of J. T. Baker Chemical Co. Has been technical director and will continue to play a leading part in the company's current plant expansion and modernization program. Joined Baker in 1944 as director of research and development. Doctorate from MIT.

Leo Garwin. Member of the research staff of the Kerr-McGee Oil Industries, Oklahoma City. Has been professor of chemical engineering at Oklahoma A and M.

F. Edwin Wisely. Design manager in the engineering department of Monsanto's organic chemicals division. Formerly supervisor of engineering design for the company's John F. Queeny plant. Chemical engineering graduate of the University of Illinois. New process manager for the division: **C. C. Richitusa** of Nitro, W. Va. With Monsanto since 1935; in charge of all design work at Nitro since 1942. Carnegie Tech graduate.

W. N. Oldham. Manager of American Cyanamid's Azusa, Calif., plant; has been assistant plant manager since 1950. Joined the company in 1939 as a chemist at the Stamford, Conn., laboratories.

A. B. Scott. Associate director of the chemical control division, Merck & Co. **C. H. Krusie:** assistant director of chemical control in charge of quality testing and maintenance. His successor as manager of quality testing: **A. J. Thompson, Jr. H. A.**

Fredinani: from manager of the analytical research department to assistant director in charge of analytical research.

Henry Gilman. Winner of the 1952 Midwest Award of the St. Louis section of ACS. Professor of organic chemistry, Iowa State College of Mechanical Arts. Associated with the college since 1919. Known for his work on organometallic compounds. Editor of "Organic Chemistry—An Advanced Treatise."

Richard L. Demmerle. Assistant director of administration, General Aniline & Film. Was executive editor, *Chemical Week*. Previous to that, associate editor of *Chemical & Engineering News* and *Industrial & Engineering Chemistry* in the New York offices of ACS.

Arthur W. Sloan. Back at his post as chairman of the board and director of research, Atlantic Research Corp., Alexandria, Va. Has been on a two-years' leave of absence on a special assignment to the department of defense.

J. T. Higgins. Manager of operations, Richmond, Calif., refinery, Standard Oil of California. Formerly Standard's assistant manager, operations control division, San Francisco. Refinery's new assistant general manager: **C. W. Rehfuss.**

Neil C. Elphick. Resident manager of the nitric acid plant being built by Westvaco Chemical Division for the government at the Sunflower Ordnance Depot, Kans.

Russell K. Edwards. Research associate, chemistry department, Illinois Institute of Technology. Doctorate in chemistry from the University of California.

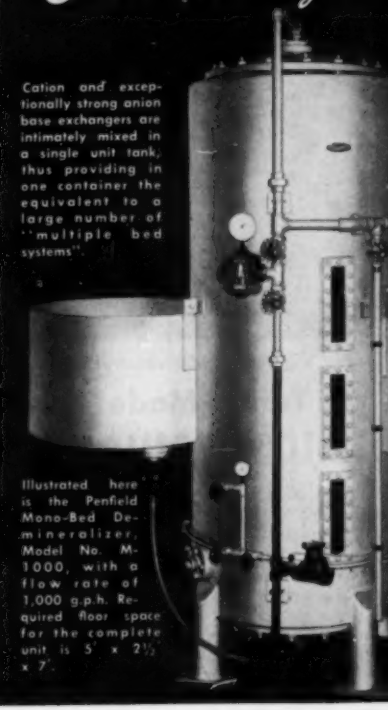
Edgar M. Queeny. New member of the board of Monsanto (Canada) Ltd. Continues as chairman of the board of Monsanto Chemical Co. and a member of its executive committee. Other new Monsanto (Canada) board members: **Charles S. Cheston,** a director of Monsanto Chemical Co.; **Felix N. Williams,** vice president, director and member of Monsanto Chemical's executive committee.

W. D. Holland. Production manager, American Cyanamid's agricultural chemicals division.

H. J. West. Technical director of American Cyanamid's plant in Bridgeville, Pa.

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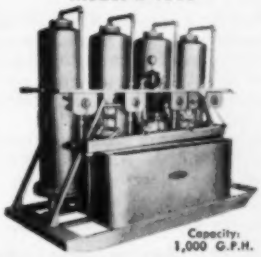
Cation and exceptionally strong anion base exchangers are intimately mixed in a single unit tank, thus providing in one container the equivalent to a large number of "multiple bed systems".

The raw water passes through the Penfield Mono-Bed Column only once, yet comes out with a mineral content of virtually zero (resistances have been reported as high as 20,000,000 ohms per centimeter).

Illustrated here is the Penfield Mono-Bed Demineralizer, Model No. M-1000, with a flow rate of 1,000 g.p.h. Required floor space for the complete unit is 5' x 2½ x 7'.

Regeneration is accomplished by the simplest and most economical method known — gravity and displacement. No water pressure is required and there are a minimum of valves to operate.

Model L-1000



Capacity: 1,000 G.P.H.

Over the past ten years, Penfield has built more four column demineralizers than any other manufacturing concern. In comparison to distilled water costs, Penfield Industrial Demineralizers provide savings as high as 85% and in one reported instance cut costs 98%. No heat or steam power is ever required and units are ready for immediate operation on arrival at site. Send for "Penfield Pays" folio giving specifications of all Penfield Demineralizing units — single, double and four column.

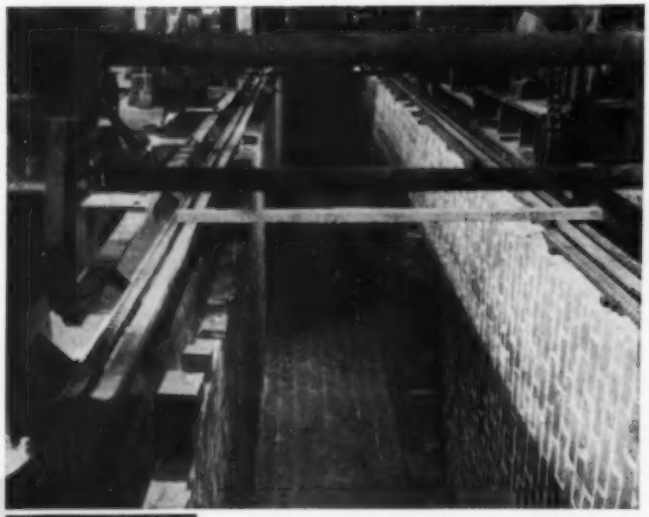
AVAILABLE IN FLOW RATES FROM 200 TO 5,000 G.P.H. AND UP

The Penfield Mono-Bed Demineralizer operates upon the most efficient deionizing technique known . . . is ideal for a large variety of processing and other operations — including power plants, mirror plating, electronic tubes, photographic finishing, *and wherever exceptionally high purity, mineral-free water is required.*

Write today, describing *your* water treating needs.

PENFIELD
MANUFACTURING CO., INC.
19 High School Ave., Meriden, Conn.
FILTERS · SOFTENERS · DEGASIFIERS · DEMINERALIZERS

Penfield "Planned Purity" PAYS!



Pickling tank under construction



Pipe and Duct Work



Complex Processing Equipment

Tailor Made
CHEMICAL EQUIPMENT

When corrosion proof equipment is needed many companies call in Maurice A. Knight as a matter of course. They have two excellent reasons for doing this. First, the Knight organization has been making chemical equipment for over 45 years. Second, each unit of Knight equipment is engineered to the specific job.

Knight equipment includes:

Knight-Ware Chemical Stoneware pipe, towers, tower packings, containers, filters, valves, etc.

Permanite (woven glass fibre-reinforced Furan Resin) HCl Absorbers, fume washers, vessels, pipe and fume ducts.

Sealon (vinyl type) tank linings.

Pyroflex (thermoplastic) seamless vessel linings.

Pyroflex Constructions: pickling and plating tanks, gas cooling towers, chlorine drying towers, acid concentrators, etc. Functional units engineered and constructed to operate satisfactorily under specified service conditions.

Whether you need pilot plant or production equipment, discuss your needs with M. A. Knight. When making inquiry, please specify service conditions.

Literature will be sent on request.

See us at Booth 53, The New York Chemical Show

Maurice A. Knight **Kelly Ave., Akron 9, Ohio**

Acid and Alkali-proof Chemical Equipment



Tanks

Reactors

Towers

Pilot Plant Equipment



NAMES IN THE NEWS, *cont. . .*

Robert Zinn. Professional lecturer on the chemical engineering staff at Northwestern Technological Institute. Also to serve as consultant to Vern E. Alden Co., Chicago.

Peter W. Sherwood. Senior engineer, process engineering department, chemical plants division, Blaw-Knox. Formerly with Koppers. New chemical engineers in the department: **Frank G. Hettler, Jr.** and **Carlisle W. Gilbert.**

William A. James. Director of research, Dearborn Chemical Co., Chicago. Formerly, senior research chemist for Standard Chemical Co., Toronto.

Richard F. Shaffer. From associate professor to head of the department of chemical engineering, Pratt Institute. On the faculty since 1945. Former employers: Du Pont, Schlegel Lithographing Corp.

James E. FitzGerald. To head a newly organized laminated plastics division of Brunswick-Balke-Collender Co., Muskegon, Mich. Has been assistant chief chemical engineer. With the company since 1940.

C. L. Dickinson. Plant manager of the Houston plant of the Kolker Chemical Division, Diamond Alkali Co. Has been in charge of plant engineering and process work since May. Formerly at the company's Deer Park plant. Chemical engineering graduate of North Carolina State College.

OBITUARIES

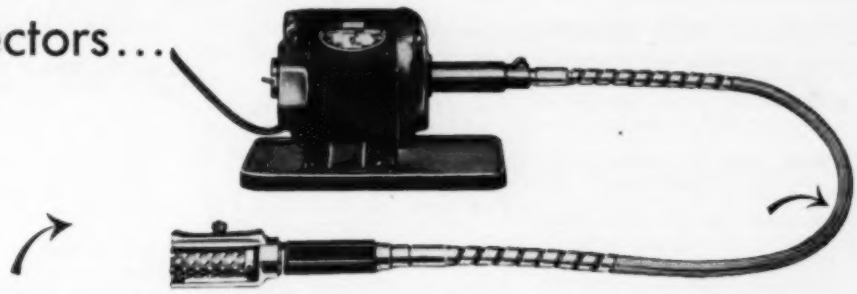
John J. Goett, 32, on the headquarters staff of Chas. Pfizer's production department, died at his home in Riverdale, N. Y., September 11. He joined Pfizer in 1945 after two years as a development engineer in the Argonne Laboratories of the University of Chicago.

Joseph Wrench, 74, who was associated with the chemical division of West Virginia Pulp and Paper Co. for 34 years before his retirement in 1946, died in Roslyn, N. Y. September 15.

Alfred Vaksdal, 65, director of new plant construction in Danville, Ky., for the Corning Glass Co., died October 9.

Earle Mauldin, Chemical Engineering's editorial representative in Atlanta, died in an automobile accident October 10.

If your product calls for action from connectors...

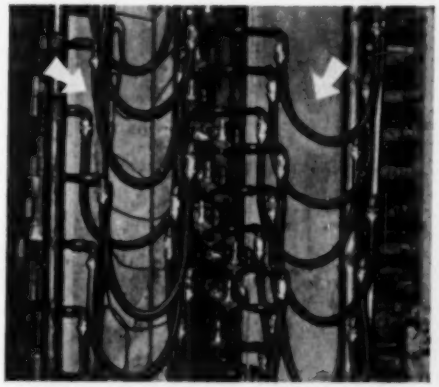


Fish Story: What could be easier than scaling a fish—if you use this model FSB Fish Scaling Machine made by The Balmar Corp., N. A. Strand Div., Chicago? The flexible shaft driving the cutter is protected in 7/16" I.D. American Type SL Flexible Steel Hose jacketed with an outer braid.

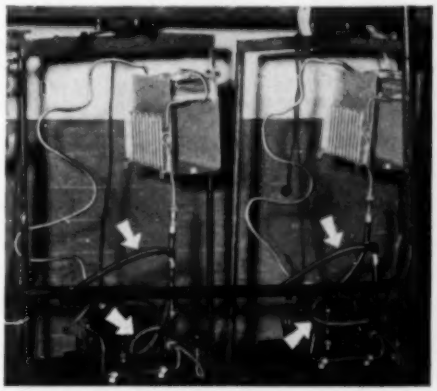
Use American Flexible Metal Hose or Seamless Tubing—the completely flexible metal connectors—where piping connectors move or vibrate; where ports are misaligned or for piping in cramped spaces where there's little room to work.

American Flexible Metal Hose and Tubing are available for carrying almost any liquid, gas or semisolid under severe conditions of corrosion, temperature, pressure and mechanical stress. You'll find full details in Bulletins SS-50 and CC-300. We would like to send you copies. The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

61242



Sandwich Maker: Sheets of plywood are bonded under heat and pressure. Heat for this Mesco hot-plate press of the Harbor Plywood Corp., Aberdeen, Wash., is provided by steam carried to the 21 platens in ½" I.D. American Seamless Flexible Bronze Tubing with single bronze braid.



Dry Fact on a Cold Subject: Before installation, every Norge household refrigeration unit is dehydrated by high vacuum in a drying oven. American ⅛" I.D. Seamless Flexible Bronze Tubing connects each unit to the vacuum manifold. Specifications call for leakproof, corrosion-resistant tubing able to operate under 31" vacuum at an oven temperature of 280°F for 4 to 6 hours.

wherever connectors must move...

American ANACONDA

FLEXIBLE METAL HOSE AND TUBING

INDUSTRIAL NOTES

NEW FACILITIES

Stein, Hall & Co., New York—A new Chicago plant for the manufacture of Hallmark Brand industrial adhesives in both dry and liquid form.

Catalin Corp. of American—More phenol-formaldehyde resin facilities at Fords, N. J. Increased production will begin about the middle of 1952.

Arthur D. Little, Inc., Cambridge, Mass.—A branch office in Mexico City headed by Richard W. Plummer.

National Lead Co., New York—A treatment plant to recover cobalt metal from ore concentrates at its Fredericktown, Mo., properties. To begin production in a little over a year, the plant will process 50 tons of concentrates per day.

W. R. Grace & Co., New York—An agricultural chemicals division for processing and distribution in San Francisco, Calif. Accent will be on organic insecticides. Division head is Charles F. Lunsford.

National Research Corp., Cambridge, Mass.—A new plant in Newton, Mass., to contain engineering and drafting departments, machine and welding shops, electronic assembly facilities.

Buffalo Electro-Chemical Co.—A $4.3-million plant at Vancouver, Wash., which has just begun full-scale production of hydrogen peroxide.

St. Regis Paper Co., New York—An addition to its multiwall bag plant at Pensacola, Fla., to begin production late in 1952.

Commercial Solvents Corp., New York—A nutritional research division of its research department in Terre Haute, Ind., to be directed by Dr. Joseph M. Pensack.

Evans Research and Development Corp.—A laboratory annex in Yonkers, N. Y., to be used primarily as a pilot plant.

Arnold, Hoffman & Co.—Completely renovated laboratory and office building at its old site in Providence, R. I.

Johns-Manville Corp., N. Y.—A 40 percent increase in the company's facilities for production of diatomite filter aids and fillers.

Armour Fertilizer Works, Bartow, Fla.—Additions, just completed, which will double capacity bringing it to 150,000 tons.

Fluor Corp., Ltd., Los Angeles—A defense projects engineering department headed by M. R. Born.

Glidden Co.—Expansion of lithopone operations in Collinsville, Ill., which will increase production by 200 to 300 tons.

Esso Standard Oil Co., New York—An emergency headquarters for the company and its affiliates to be located on a newly-purchased site in Mendham, N. J.

Shell Chemical Corp., New York—More capacity at Houston for ethyl chloride production. The addition, which is under construction, is a move to increase the supply of tetraethyl lead and ethyl cellulose.

Kaiser Aluminum & Chemical Corp.—A $4-million installation of smoke and fume control equipment at its Mead reduction plant near Spokane, Wash. Construction work began this fall.

NEW COMPANIES

American Petrochemical Corp., to manufacture essential chemicals from petroleum hydrocarbons at a plant to be built at Lake Charles, La. Ultimately, the corporation's production will encompass plastics, synthetic rubber, additives for lubricating oil. Firestone Tire Rubber Co. and Cities Service are co-owners.

Jameson Chemical Co., Chicago, to supply on a national scale chemical raw materials manufactured to specification. Company founder is A. R. Jameson, until recently first vice president of Velsicol Corp.

Mic-Lin Co., Philadelphia, to specialize in machining Teflon to close tolerances.

Norton Behr-Manning Overseas, Inc., to handle all of the export business and direct the subsidiary plant operations throughout the world of the Norton Co., Worcester, Mass., and Behr-Manning Corp., Troy, N. Y.

Tenn.-Tex Alloy & Chemical Corp., Houston, to produce ferro manganese and ferro silicon. Plant is expected to go into operation in about a year. It is a joint venture of the Tennessee Product & Chemical Corp. and the Sheffield Steel Co. of Texas.

British-American Carbon Co., New York, to manufacture and sell a wide range of carbon and graphite products used principally by the chemical, metallurgical and process industries. A joint venture of Great Lakes Carbon Co., New York, and Powell Duffryn Carbon Products Ltd., the new firm will be the sole user in the United States of the Delanium process and its products will include the Delanium cubic heat exchanger and specialties developed by Powell Duffryn.

NEW NAMES

Farac Oil & Chemical Co., Chicago manufacturer of tall oil fatty acids, has changed its name to Faresac Co.

Special Chemicals Co., Cleveland, manufacturer of polyvinyl acetate beads and emulsions, has changed its name to Colton Chemical Co.

NEW LOCATIONS

American Cyanamid Co. has consolidated its several office and warehouse locations in Los Angeles, Calif., into one newly-constructed building at 2300 South Eastern Ave.

Publicker Alcohol and Chemical Sales Corp. has moved its New York offices to 424 Madison Ave.

Wheelco Instruments Co. has moved its western division sales office to 2320 Milwaukee Ave., Chicago.

American Hard Rubber Co. has moved its executive, sales, purchasing and general accounting departments to modern offices at 93 Worth St., New York.

Lindberg Instrument Co., whose principal product is a phonograph pickup cartridge called Fluid Sound, has moved to larger quarters at 1808 Harmon St., Berkeley, Calif.

FACTS about CHEMICAL ENGINEERING

.....FOR *RAW MATERIALS* ADVERTISERS IN THE *CHEMICAL PROCESS INDUSTRIES*



R.W. HOOKER, VICE PRESIDENT IN CHARGE OF SALES, **HOOKER ELECTROCHEMICAL CO.** SAYS," THE PRODUCTION-ENGINEERING AUDIENCE WHICH **CHEMICAL ENGINEERING** PROVIDES IS OF GREAT IMPORTANCE TO US IN OUR DISTRIBUTION OF CHEMICALS FOR THE *CHEMICAL PROCESS INDUSTRIES*. THAT IS WHY **C.E.** HAS BEEN AN IMPORTANT FACTOR IN OUR ADVERTISING PROGRAM SINCE 1910."

THE BIG SAY-SO!
PRODUCTION HAS A VITAL INFLUENCE IN SPECIFYING CHEMICAL RAW MATERIALS BECAUSE *PRODUCTION* IS RESPONSIBLE FOR THE FINISHED PRODUCT. AND **C.E.** HAS MORE PRODUCTION-ENGINEERING-PLANT OPERATING SUBSCRIBERS THAN ANY OTHER PROCESS PUBLICATION.



THE BEST SOURCE OF ALL.... ON "WHO BUYS RAW MATERIALS" ARE THE MEN WHO SELL THEM. **C.E.** SURVEYED *THE SALESMEN'S ASS'N OF THE AMERICAN CHEMICAL INDUSTRY.* PRODUCTION RANKED AT THE TOP.



NO BETTER INDICATOR...
...OF THE INTEREST OF **C.E.** READERS IN RAW MATERIALS. IN THE ADVERTISING RESEARCH FOUNDATION STUDY OF **CHEMICAL ENGINEERING** THEY RECEIVED **50%** MORE READERSHIP THAN ANY OTHER PRODUCT CATEGORY. SIX OF THE TOP 20 BEST-READ ADS WERE ON RAW MATERIALS.

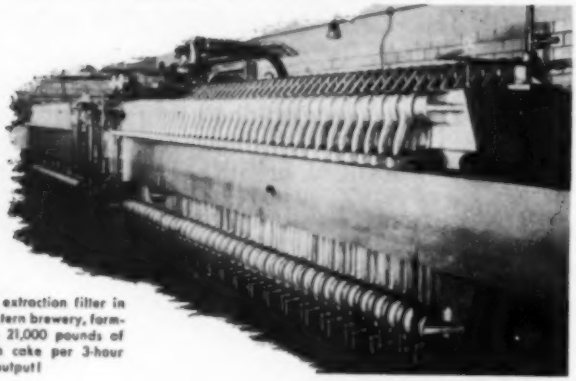


ABC

Chemical Engineering

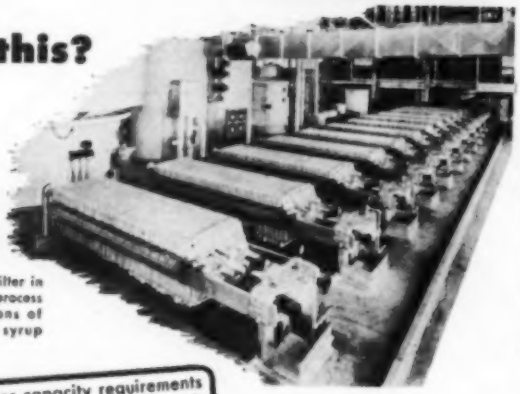
A McGraw-Hill Publication
330 West 42nd. Street, New York 18, N. Y.

Need Filter Capacity
as big as this?



Double mash extraction filter in prominent Eastern brewery, forming 15,000 to 21,000 pounds of sparged mash cake per 3-hour cycle. That's output!

or this?



Each 60-chamber filter in this battery can process up to 2500 gallons of sugar juices and syrup per hour.

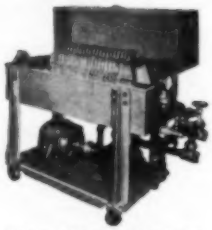
Whether your filter capacity requirements call for a few gallons of filtrate per batch or thousands of gallons of filtrate or tons of cake per hour—

Whether your material is easily filterable; or slimy, viscous or otherwise troublesome—

Whether it must be filtered at high or sub-normal temperature—or at pressures of 750 p.s.i. or more—

No matter how much or how little your production, you can get dependable filtration rates and quality at low operating cost if your equipment is a Shriver Filter Press. And the Shriver Catalog tells why. Write for it. T. Shriver & Company, Inc., 802 Hamilton St., Harrison, N. J.

or this?



This small portable, enclosed filter unit permits filtering and washing with any number of its 20 chambers.

FOR BETTER FILTRATION

Shriver FILTER PRESSES

INDUSTRIAL NOTES, cont. . .

Extruders, Inc., West Coast manufacturer of plastic films and tubing, has moved to larger quarters at 3232 West El Segundo Blvd., Hawthorne, Calif.

Howe Scale Co., Rutland, Vt., has moved its Chicago branch to 1915 North Harlem Ave.

Safety Clothing & Equipment Co., Cleveland, has moved its manufacturing facilities and offices to 1990 East 69th St.

NEW LINES

General Paint Corp., Los Angeles—Aircraft finishes, oil-base and nitrocellulose-base products, and such special products as vinyls, butyrates, silicones, methacrylates. A new department has been formed to develop and manufacture these products.

Turner White Metal Co., New Brunswick, N. J.—Aluminum tubes to supplement their present production lines for the manufacture of tin, lead and tin-coated lead tubes.

Raffi & Swanson, Inc.—Surface coatings business of Monsanto's Merrimac Division at Everett, Mass. Raffi bought all of the latter's manufacturing equipment and physical assets.

NEW REPRESENTATIVES

Metals Disintegrating Co., Elizabeth, has appointed A. C. Mueller Co., as its Cleveland representative.

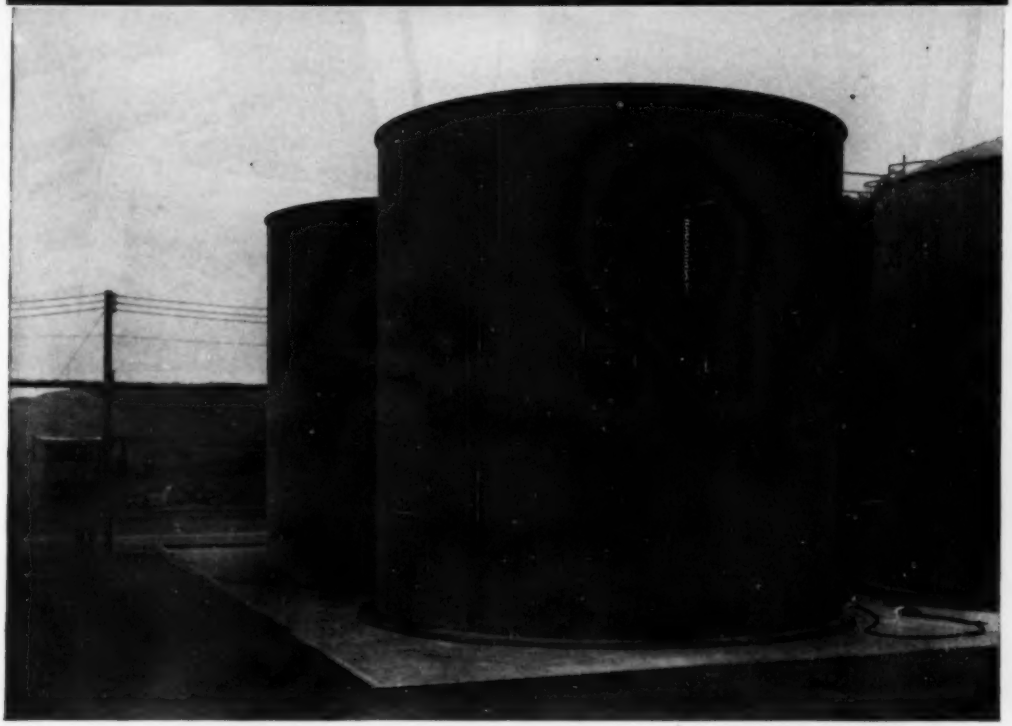
Arcos Corp., Philadelphia manufacturer of stainless low alloy high tensile and non-ferrous electrodes, has named two new distributors: Clements Welding & Machinery Co., St. Louis, Mo.; R. & R. Welding Supply Co, Des Moines, Iowa.

Hanna Engineering Works, Chicago, has appointed Sweetland-Affleck Corp., Pasadena, as its exclusive dealer for Central and Southern California.

Prentiss Drug & Chemical Co., New York, has appointed S. L. Abbot Co. of San Francisco and Los Angeles as its West Coast representative.

American Resinous Chemicals Corp. and **American Polymer Corp.**, Peabody, Mass., and their associated companies have appointed Baker & Collinson of Detroit their agents.

FIELD-ERECTED CAUSTIC TANKS AT A NEVADA CHEMICAL PLANT



HANDLE WITH CARE—IT BURNS!

These two 150,000-gallon Horton tanks at the Stauffer Chemical Company's plant in Henderson, Nevada are used to store liquid 50 per cent caustic soda. Caustic soda, which is a water solution of sodium hydroxide, can cause a painful burn if it comes in contact with a person's skin. It can, however, be stored safely and efficiently, at normal temperatures, in plain carbon steel tanks of welded construction.

The two Horton caustic soda tanks in the above installation are typical examples of the type of plain flat-bottom field-erected steel tanks we are equipped to build. We also fabricate and erect structures made from:

- CLAD STEELS — Chrome-nickel or straight chrome stainless, or monel.
- LININGS — Chrome-nickel or straight chrome stainless steel, monel or everdur.
- SOLID CORROSION-RESISTANT METALS — Chrome nickel or straight chrome stainless steel, monel, aluminum or everdur.

Whether you require specially fabricated structures, flat-bottom tanks or elevated water tanks—write Chicago Bridge & Iron Company for estimates or quotations. Our four strategically located plants are prepared to serve you.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3.....2120 Healey Bldg.
Birmingham 1.....1510 North Fiftieth St.
Boston 10.....1005—201 Devonshire St.
Chicago 4.....2124 McCormick Bldg.
Cleveland 15.....2220 Guildhall Bldg.
Detroit 26.....1503 Lafayette Bldg.
Houston 2.....2103 National Standard Bldg.
Los Angeles 17..1505 General Petroleum Bldg.
New York 6.....3318—165 Broadway Bldg.
Philadelphia 3...1625—1700 Walnut St. Bldg.
Salt Lake City 4....505 West 17th South St.
San Francisco 4.....1522-200 Bush St.
Seattle 1.....1305 Henry Bldg.
Tulsa 3.....1623 Hunt Bldg.
Washington 6.....1160 Cafritz Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

CMH FLEXIBLE METAL



- ✓ Oil Burner connections
- ✓ Gas connectors
- ✓ Steam lines
- ✓ Lubrication hose
- ✓ Pneumatic hose
- ✓ Chemical hose
- ✓ Tar and Asphalt lines
- ✓ Diesel Engine Exhaust connections
- ✓ Vacuum lines
- ✓ Refrigerant lines
- ✓ Armor
- ✓ Ventilating ducting
- ✓ Exhaust ducting

Whenever vibration, misalignment, flexation or expansion and contraction exist in any of these services (and many others) use CMH FLEXIBLE METAL HOSE

CMH —One dependable source for

HOSE . . .

the answer to 101 connection problems in the processing plant

Motion or misalignment in piping is a serious and potentially dangerous problem that exists in almost every plant . . . but, in most cases the solution is a simple one—use CMH Flexible Metal Hose as the connecting link between moving parts or between misaligned sections. Whether the motion is a fraction of an inch or scores of inches, there is a suitable type of CMH Flexible Metal Hose to meet the need.

For conducting liquids or gases or even granular solids . . . hot or cold . . . CMH Flexible Metal Hose combines the rugged durability of metal with a high degree of flexibility. In addition, CMH Flexible Metal Hose gives you the non-aging, non-contaminating characteristics so necessary to long, trouble-free service.

In CMH's complete line of flexible metal hose products there are types suitable for pressures up to 12,000 psi (burst) and for temperatures from far below zero to 1600° F. Whatever your connection problem or if you require durable, heat and corrosion resistant hand hose, get full information on CMH Flexible Metal Hose from your CMH distributor. See your classified telephone directory or write for his name. If you would like to have descriptive literature, write for it, mentioning the nature of your requirements.

CHICAGO METAL HOSE CORPORATION

1317 S. Third Ave. Maywood, Illinois

Plants at Maywood, Elgin, Rock Falls and Savanna, Illinois

In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ontario



CMH corrugated hose is available in steel, bronze and stainless steel for high temperature, high pressure applications.



CMH square locked hose is available in steel or bronze with a variety of packings for use as nozzles, armor, ducting, etc.



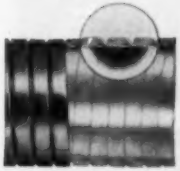
CMH interlocked hose is available in steel, brass and other alloys for use as ducting, armor, exhaust lines and similar applications.



CMH ball bearing design hose is available in steel, bronze or stainless steel with a variety of packings and with or without metal braid covering for low pressure service.



CMH interlocked steam, oil and tar and asphalt hose is available in steel or bronze with asbestos packing for medium pressure utility service.

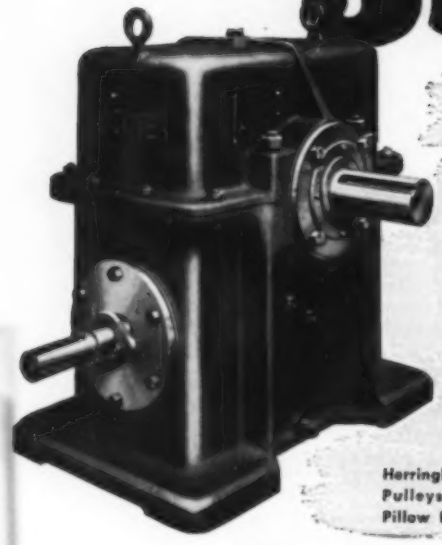


CMH abrasion resistant interlocked tubing is available in steel for conveying dry solids such as grain, sawdust, ashes, etc.

In addition to the types illustrated CMH also manufactures standard hose assemblies for such services as steam, tar and asphalt, machine tool conduit, also metallic bellows and expansion joints for piping,

every flexible metal hose requirement

Jones



WORM GEAR SPEED REDUCERS

A right angle unit built for heavy duty performance in any industry. The worm can be above or below the gear. Shafts are single or double extended for coupling connections or chain or gear drives.

They are built in ratios from 4 to 1 to 90 to 1 and in capacities from ¼ to 100 H.P.

Bulletin No. 68 covers selection tables and dimensions.

W. A. JONES FOUNDRY & MACHINE CO.
4415 W. Roosevelt Rd., Chicago 24, Ill.

Since 1890 Jones In the Service of Industry

Herringbone — Worm — Spur — Gear Speed Reducers
Pulleys · Gears · V-Belt Sheaves · Anti-Friction
Pillow Blocks · Friction Clutches · Flexible Couplings

MIGHTY IMPORTANT "ACCESSORIES"



FLUSH-BOTTOM VALVES . . . Flush-type plug valves are available in all commercial sizes. Made of materials adaptable to corrosive or non-corrosive conditions. Can be specially designed for critical pressures, for hand-wheel or bevel-gear operation.

Men who work with high-temperature, high-pressure equipment appreciate the attention Blaw-Knox gives to every detail of design and fabrication of pressure vessels. Design features exceed ASME and State requirements, assuring a longer useful life for your investment.

Send for Blaw-Knox Bulletin No. 2355

AGITATORS
Many types, each designed to provide strong sweeping motion at heating surface and turbulence of kettle's contents.

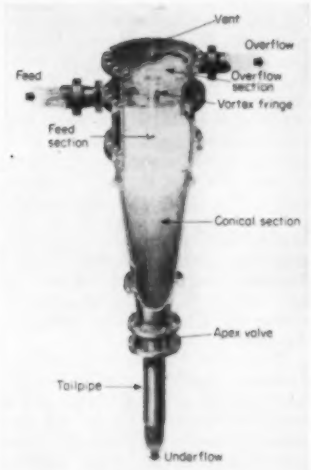




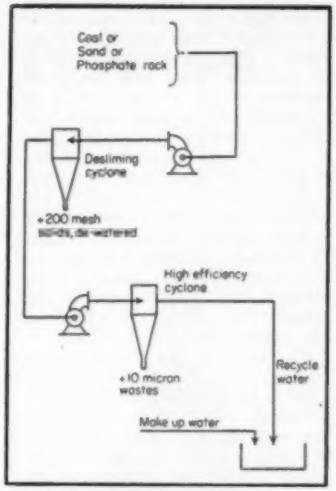
HANDHOLES-MANWAYS . . . are of quick-opening design in standard sizes complete with attachments for welding or bolting to existing kettles. The materials utilized suit operating conditions for low, medium, or high pressure.

PROCESS EQUIPMENT DEPARTMENT
BLAW-KNOX
DIVISION OF BLAW-KNOX COMPANY

2090 FARMERS BANK BLDG., PITTSBURGH 22, PA.
Other Offices in Principal Cities



CYCLONE gives cheaper separations . . .



SYSTEM is faster, more efficient.

More Data on Solids Recovery From Slurries by Cyclone

An over-all look at a recent development. Here is a roundup of data on design, operation, performance. Needed: more plant-scale testing with a wider-variety of slurries.

Joseph J. Moder, Jr.

Cyclone separators have long been a favorite engineering tool for removing fine-particled solid contaminants from gaseous streams. Recently the basic principle, centrifugal force, has been applied to separations involving liquids and solids in equipment very similar to the familiar gas cyclone.

A very high degree of separation is possible when sufficiently large gravity differences exist between the solids or liquids or when the solids are coarser than ¼ in. However, high efficiencies are either unobtainable or uneconomical with less extreme conditions if only the force of gravity is employed in the separation process. The use of centrifugal force to improve efficiency and capacity by increasing the settling velocities of fine particles is possible, but in many cases it is too costly with mechanical centrifuges. In these cases the liquid cyclone has been utilized to effect a high quality and capacity separation at a very low cost.

HOW IT WORKS

As can be seen in the above cut, the liquid cyclone closely resembles the older, more familiar gas cyclone both in appearance and operation. The general flow pattern inside the cyclone is quite similar in appearance to the storm for which it is named. A mixture introduced tangentially into the cylindrical feed section assumes a rapidly swirling motion, the two exits causing the formation of a double vortex. The heavier portion of the feed is carried outward and downward through the conical section by centrifugal force, exiting through the apex valve and the tailpipe. At the same time, the lighter portion, which forms the inner vortex, is forced upward through a centrally located tube called the "vortex finder" into the overflow section and out via the overflow pipe. Control of the internal flow pattern is a function of cyclone design, the dimensions of the inlet, overflow, and underflow nozzles being among the important factors, in addition to the inlet pressure head.

It has been estimated that the liquid cyclone is capable of creating a centrifugal force several thousand times that of the earth's gravitational force with capacities from 200 to 400 gal. per min. per sq. ft. of cyclone cross-sectional area.

DESIGN OF THE LIQUID CYCLONE

In order to determine the applicability of the liquid cyclone in effecting a given separation, it is necessary to have quantitative information as to the separation that can be expected as a function of the various design and operating variables. Once the applicability of the process has been established, additional data are required for calculating the number of stages of separation needed and determining how each stage should be designed and operated to obtain maximum efficiency.

Although the liquid cyclone is simple in appearance, a considerable number of design variables are involved in its construction. Among the more important are the dimensions of the three nozzles, the diameter of the cyclone cylinder, the included angle of the cone, the position of the overflow nozzle, the angle and placement of the inlet nozzle and the height of the cylindrical section.

For recommended designs quantitative empirical correlations have been developed which relate the solids classification size or the percent solids separation obtainable with the cyclone design and operating variables and with the properties of the materials being separated. Since liquid cyclones can be operated in series, without intermediate pumps if desired, literally any degree of separation can be obtained by use of a sufficient number of stages of separation. These correlations, then, make it possible to determine the applicability of the liquid cyclone in effecting a given separation and to calculate the number of stages of separation required.

USE AS CLASSIFIERS, DESLIMERS

Depending on cyclone design and operation, the particle classification size can be varied from approximately 10 to 70 microns for the usual type of industrial slurry. Because of the uniformity and symmetry of the velocity gradients within the cyclone, a relatively sharp separation of particles

QED, cont. . .

is obtained. Practically all of the particles coarser than the classification size report to the underflow stream, while particles finer than the classification size exit in the overflow stream.

Cyclone separation can be applied to a surprisingly large number of problems, particularly in the mining industries. The desliming of coal, phosphate rock and sand are but a few of the applications of the liquid cyclone as a high-speed classifier. A simplified flowsheet of a typical classification operation is given (see cut). The feed for this process might be a wash-water stream in a coal tipple or one of the product-bearing streams in a sand or phosphate rock plant. The usual problem is to obtain the coarse solids (+200 mesh) in a dewatered state, relatively free of the finer-particle slimes. In this process, the feed stream is pumped into a desliming cyclone which is designed and operated to classify at approximately the 200-mesh point. As seen from the table, test results for this operation indicate that approximately 97 percent of the desired + 200-mesh material is recovered in a desliming-cyclone underflow stream at a solids concentration of about 70 percent for sand and phosphate rock and 50 percent for coal, a less dense material. The data also indicate that more than 90 percent of the undesired finer material is eliminated in the cyclone overflow stream. As indicated in the flow sheet, the overflow stream is reworked in a "high-efficiency" cyclone which will eliminate particles down to about the 10-micron size. In some cases this cyclone will produce an overflow stream which can be reused in the process together with a small amount of fresh water make-up. This reduces or eliminates the need for large settling ponds, a serious problem in many industrial plants today due to the present trend in stream-pollution legislation.

The high-efficiency cyclone can be replaced by a second desliming cyclone to increase the product recovery, should the value of the material warrant such an operation. The second desliming cyclone, designed and operated in the same manner as the first, will have approximately the same percentage recovery of the +200-mesh material as before; i.e., 97 percent. Thus, two desliming cyclones in series will yield an over-all recovery of the +200-mesh material of $97+(97\times0.03) = 99.9$ percent.

To those familiar with classification equipment, the data developed show a striking improvement over conventional equipment in both capacity and recovery.

The elimination of solids by the liquid cyclone might prove to be a solution to the prevention of stream pollution by sewage and industrial wastes. The cyclone would concentrate the refuse material in a very small volume, thereby giving a readily disposable overflow stream. Solids elimination might also be utilized to separate a product material from its mother liquor in crystallization operations and the like.

The use of the liquid cyclone in separating liquid materials of different specific gravities is still in the speculative stage. However, the separation of water-oil mixtures from petroleum wells and similar applications seem worthy of investigation.

From *The Research Engineer*, Sept. 1951, p 5.

Energy: Will Supply Meet Demand?

Two prominent authorities* appraise our shortages, reserves, potentials. Storm warnings are out in the West, but neither limits nor politics can control continuous energy.

In the next decade, the total energy requirement of process industries in the form of fuel and electricity is expected to be more than 40 percent of the total for all manufacturing industries.

So great an interest carries proportionate responsibilities. Maybe atomic energy is a panacea; maybe, as James Bryant Conant believes, solar energy will carry a large share of the burden. No matter what will make the wheels of 1960 go 'round, we need the insurance of a new source of low-cost energy. We owe it to ourselves to push, to the limit, research on the upgrading of what nature has given us, and to substitute plentiful and inexhaustible resources for finite ones.

. . . *Discontinuous Sources*

COAL: IMMEDIATE VIEW

Coal is our basic fuel resource. It supplies about half our electricity and 45 percent of our total demand for energy. The expanded steel program has created a new high demand for coking coal. Coke ovens are now the largest bituminous coal consuming group, accounting for 28 percent of total current consumption. In 1951, coke oven consumption is expected to set a new high of over 113 million tons.

This year also will be the peak year for coal consumption by electric utilities. Their demand for coal is expected to be heavy for the next five years, as the utility expansion program continues.

On top of these heavy demands we must send coal to the other free nations. These exports are expected to reach 35 million tons this year.

Fortunately, coal is a flexible resource and production can be expanded rapidly. One bottleneck, however, is found in transportation. There is a shortage of open-top railroad cars which may cause serious trouble this winter in getting coal to the consumer. If spot shortages do occur, directives and temporary allocations will be needed.

Production by beehive and oven coke plants is expected to reach an all-time peak of about 80 million tons this year—10 percent over 1950, and 7 percent over the previous peak year of 1948.

Despite the programmed increase in facilities, a deficit of 3 million tons of coke is estimated for the end of 1952. Additional efforts, principally through financial assistance, are being made to close the gap between demand and supply.

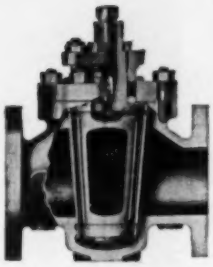
By the end of 1952 the total capacity of all coke facilities is expected to be about 84 million tons.

The United States coal industry in 1945 produced 632 million tons of both bituminous and anthracite, a wartime peak. During 1950 production was 556 million tons. The reduction in production can be laid to several factors, one important one being the increase in diesel locomotives on the railroads. It should be pointed out, however, that coal is one of the

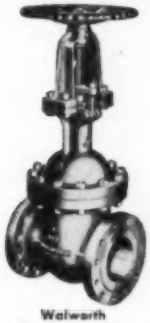
* G. W. Gleeson, Dean of Engineering, Oregon State College and Oscar L. Chapman, United States Secretary of the Interior.

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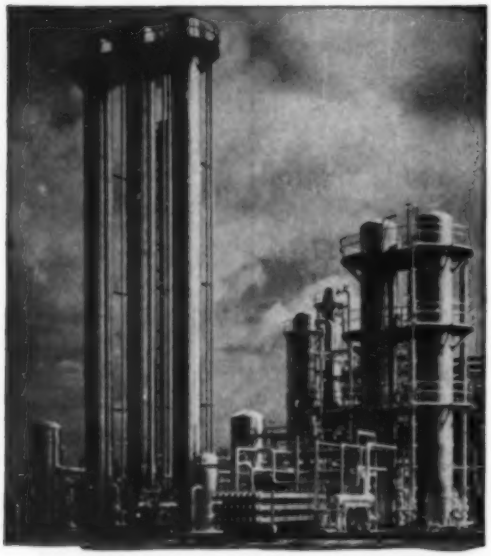
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QED, *cont.* . .

Nation's great energy resources and cannot be overlooked in any long-range plan for strengthening the peace-time or defense-time economy.—*Oscar L. Chapman.*

COAL: LONG RANGE VIEW

Coal is abundant, not inexhaustible.

Estimates of reserves vary from 200 to 1,500 years supply as based upon the current annual total requirement of the U. S. Probably the actual value lies somewhere between.

There are disturbing factors, however.

1. Certainly coal will become more costly to produce and more costly to use. It will come from thinner and less accessible seams in more remote areas. It will have higher ash, more sulphur, lower heat values.

2. Coal becomes more and more costly to transport.

3. No single coal deposit is known that will provide for large-scale production in an immediate, convenient, and economic manner sufficient for liquid fuel production by synthesis.

Underground gasification may prove feasible without large waste.—*G. W. Gleeson.*

ELECTRIC POWER: SHORTAGES

This country's need for electric power has gone up at a constantly accelerating rate ever since the last war. Industry's need for electric power is expanding faster than industry's rate of production, for the simple reason that the amount of power used per man-hour of labor in industry is steadily rising, and in 1953 is expected to be 2½ times as much as at the close of World War II.

The power industry, public and private, had a capital of 69 million kilowatts at the end of 1950. By the end of 1953, it is estimated that this capacity should be 96 million kilowatts.

This programmed expansion is very impressive on paper. The only trouble is that the demand for electric energy is going up at a corresponding rate, and it is by no means certain that we shall actually attain our goal. Shortages of material may slow down our expansion of capacity, while bad water conditions are today subtracting from the effective capacity we already have.

Controlled materials, especially steel, copper and aluminum are needed by the utilities from 12 to 24 months ahead of in-service dates. Material requirements have been so great that the power program has not stayed on schedule, and at no time in World War II did the electric power supply picture look as dark as it now

looks for the fall and winter of 1952.

For the unhappy fact is that we are already meeting very severe power shortages. The worst of these is taking place in the Pacific Northwest, where about half of our aluminum capacity is situated.

Low water conditions in the Northwest have compelled us to issue a curtailment order, and it has been necessary for the Bonneville Power Administration, under its interruptible power contracts, to reduce the flow of power to some of its customers, including industries which are engaged in critical defense production.

In the Southeast, the power shortage is growing. Low water conditions have kept the Cooper-Santee Reservoir system in North Carolina 42 percent below its average level for 21 months. Consequently, power supplied to an essential aluminum producer has been curtailed. The general industrial north central region is expected to be short about one million kilowatts before the end of 1952, unless there is a substantial improvement in the supply of materials for the power program.—*Oscar L. Chapman.*

PETROLEUM: IMMEDIATE VIEW

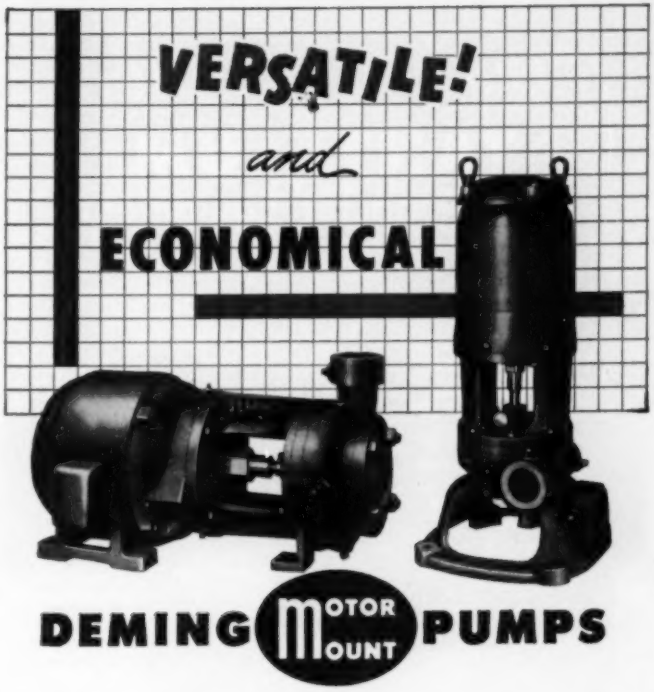
Some 610,000 bbl. per day were lost to the free world trade when the Abadan refinery shut down in Iran last June. Every effort has been made to overcome that loss. Crude oil production in the Middle East and the Caribbean areas has been stepped up, by about 175,000 bbl. per day. Over 100,000 bbl. per day of Middle East crude that normally moves to refineries along the East Coast of the United States is being diverted to Eastern Hemisphere refineries.

Even so, about 230,000 bbl. per day of products in addition to this new output have to be supplied if the whole of lost Iranian production is to be replaced. At present this can be done only by the United States.

So far, it is being supplied—in large part, at least—due to some extraordinary efforts by the oil industry. We estimate that over the next five years the United States should increase domestic production by about 250,000 bbl. per day, annually, provided the men and materials are available. That assumes that we shall be able to meet a program of sinking 43,400 new wells each year.

We are producing in the United States today about 6 million barrels of oil daily and we are consuming about 7 million barrels a day. In other words we are compelled to find a million barrels a day from foreign sources.

We cannot become complacent about the petroleum situation but must bend all our efforts to explora-

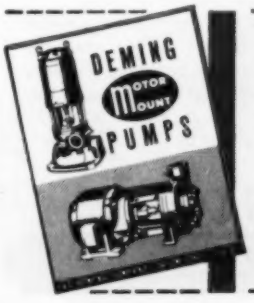


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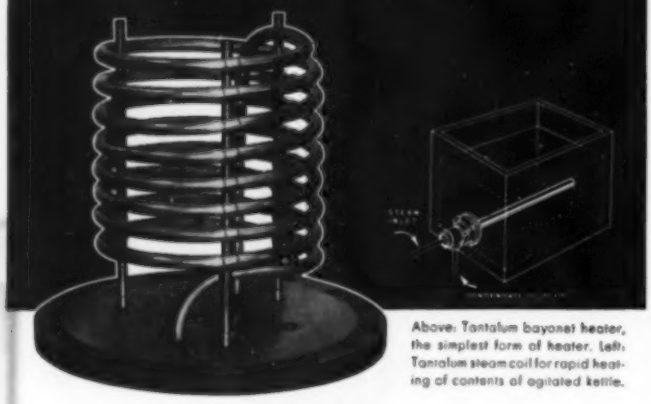
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TANTALUM

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Case history after case history testify to the fact that Tantalum heat exchangers not only effect savings which pay for the equipment in very short periods of time but, in the long run, give economies in maintenance which appear as big black profit figures.

How is all this made possible? By the very nature of the metal from which the heaters are made . . . tantalum. Tantalum combines the physical properties of steel with the chemical properties of glass, giving it three important qualities. 1. Speed in heat transfer. 2. Acid proof—for most acid solutions and corrosive gases or vapors. 3. Freedom from thermal shock. The results . . . the heaters heat faster, saving time, fuel and space—have a long life expectancy—give freedom from product contamination due to corroded equipment. Single bayonet-type Fansteel Tantalum Heaters are standard. Multiple bayonet and shell and tube type heat exchangers are designed and built to specifications.

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TANTALUM

CHEMICAL PLANT EQUIPMENT

QED, cont. . .

tion and the development of a synthetic liquid fuels industry by private capital.—*Oscar L. Chapman.*

PETROLEUM: LONG-RANGE VIEW

The U. S. Produces over one-half the oil of the world and consumes the major portion of its production. If we produce as much oil in the future, we shall have to locate the equivalent of 100 fields of 100 million barrels each. This does not appear probable.

Recent estimates have indicated a period of petroleum shortage after 1955, becoming increasingly acute with time. Other estimates are not so pessimistic and there is no way of knowing whether we shall add 10 or 55 million barrels of oil to our domestic reserves. Even the most optimistic figure, however, does not prolong the life of our domestic resources greatly—particularly if we continue the expansion of petroleum use.

Considering the important uses of petroleum for motor fuel, solvents, petrochemicals, etc., it appears foolhardy to use petroleum as a source of energy for space heating or for transportation motive power when other fuels may be substituted.—*G. W. Gleeson.*

SYNTHETIC LIQUID FUELS

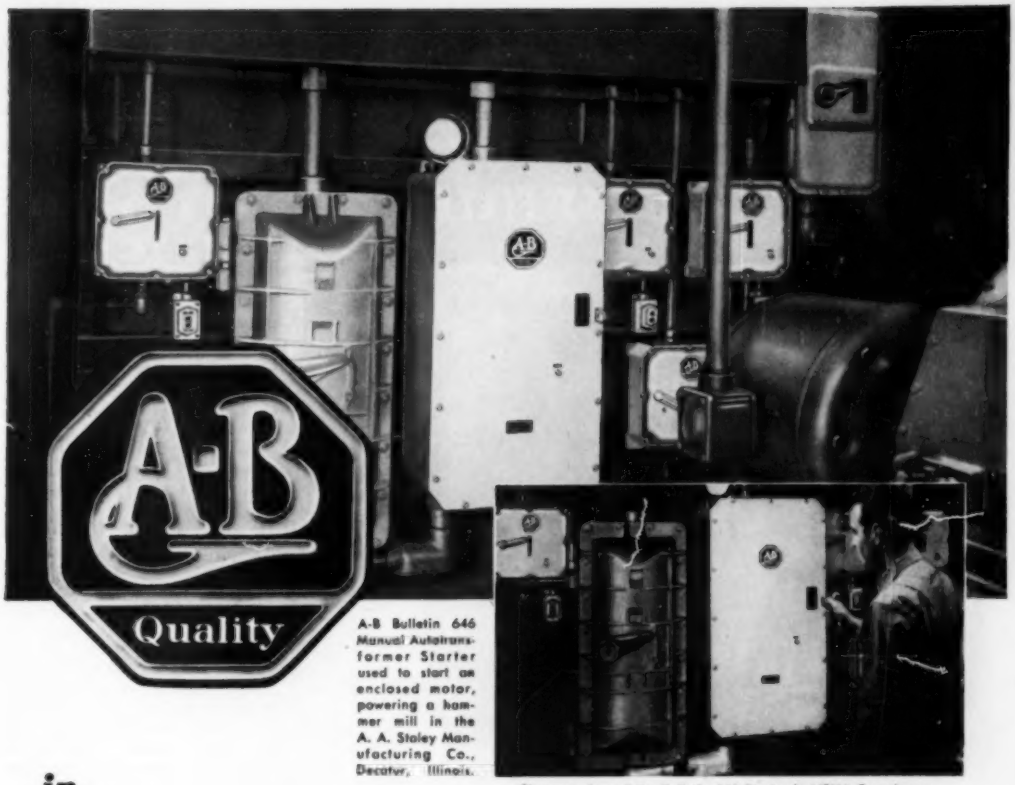
The Bureau of Mines began an extensive synthetic liquid fuels research program in 1944. I believe that we are now approaching the point where it will be economically feasible to produce liquid fuels from western shale, bituminous coal and lignite.

I believe that, before long, private industry will find it profitable to move into this field and put these processes into full commercial operation. In the present defense emergency, with steadily increasing pressures on our suppliers of petroleum and chemicals, the cost factor in these synthetic operations may become less important than it would normally be.

Last year the bureau's coal-to-oil demonstration plant at Louisiana, Mo., produced 300,000 gal. of liquid fuel, now being tested by our military forces with good results. In addition, we know that the coal hydrogenation process produces highly important chemicals.

We also have enormous reserves of lignite. In North Dakota alone, there are more than 300 billion tons of recoverable lignite.

The possibilities for this material are immense. We can make coal from lignite and we can also get some extremely valuable chemicals. Lignite can eventually become the base for an extensive industrial development



A-B Bulletin 646 Manual Autotransformer Starter used to start an enclosed motor, powering a hammer mill in the A. A. Staley Manufacturing Co., Decatur, Illinois.

Close-up view of the Bulletin 646 Starter in NEMA 9 enclosure.

in

EXPLOSIVE ATMOSPHERES . . .

where you need safe enclosures . . . install Allen-Bradley starters

In such places as corn and soybean processing plants . . . where grain dust is always a hazard . . . modern mills are equipping their electrical machines with Allen-Bradley trouble free controls installed in NEMA 9 explosion proof enclosures.

The selection of A-B starters is always a wise choice. They are so trouble free. Especially is this a valuable feature where bolted enclosures are concerned . . . since A-B double break, silver alloy contacts require no cleaning, filing, or dressing. Therefore, frequent inspection is unnecessary.

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DAY TYPE "AC" DUST FILTER



The DAY Type "AC" Dust Filter provides more efficient filtering for many chemical dusts.

Here are several reasons for this outstanding performance, and why you can rely on the DAY Type "AC" Dust Filter to meet your dust filtering problems more efficiently and economically:

1 CONTINUOUS-AUTOMATIC OPERATION: reverse jet rings travel slowly up and down the tubes cleaning them continuously with a maximum cloth area loss of only 1¼% at any time. This eliminates cleaning shutdowns and provides continuous, automatic operation with constant air volume.

2 SPECIAL FELT FILTER CLOTH: the gentle, yet positive reverse jet cleaning action permits the use of this high grade wool filtering fabric which collects even the finest dust particles. (Actual tests have shown up to 99.998% collection efficiencies.) Also, the use of this type of cloth allows higher air-to-cloth ratios of 10, 15 or even 20 to 1 with uniform back pressures.

3 OUTSTANDING ADAPTABILITY: units can be furnished in multiples of 4 tubes; sectionalized steel panel housings (see illustration) for filters requiring vacuum or outdoor installations; quick opening clamps simplify erection and permit removal of sections for easy access to filter. (The DAY Type "AC" Dust Filter can be supplied without housing where housing is not essential.)

4 NO DUST CATCHING LEDGES: DAY Type "AC" Filters with a pattern of square-to-round inlet fittings, have no flat surfaces where dust can accumulate and become contaminated.

5 SEPARATED DUST STREAMS: one DAY Type "AC" Dust Filter is able to handle as many as four different product streams simultaneously, without mixing.

WRITE-TO-DAY FOR BULLETIN 491

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QED, cont. . .

in the Dakota region, and it can also help to supply low-cost electric power.

As an example of one way lignite can be used: In Texas, Alcoa is now building a new aluminum plant, to be powered—in cooperation with the Texas Power and Light Co.—with low-cost Texas lignite. As a byproduct, this use of lignite will produce substantial qualities of tar, greatly needed by the chemical industry.—*Oscar L. Chapman.*

OIL SHALES: UNDEVELOPED POTENTIAL

The combined results of the U. S. Geological Survey, the U. S. Bureau of Mines, General Petroleum, and a report upon the naval oil-shale reserves indicates a probable 345 billion barrels of oil, although the deposits have not been surveyed completely. This is about 10 times our total petroleum production to date and, as such, represents a vital, undeveloped potential.

The oil yield from the shale varies greatly from traces to as high as 60 gal. per ton of shale. The principal costs of mining, transport and retorting are the same, regardless of the yield. Hence there must be some cut-off value below which oil recovery would be impractical. This figure has been arbitrarily set as 30 gal. per ton.

With such a cut-off figure, allowing for mining losses, and with due regard for costs of extraction up to a figure as high as four times the current price of competitive crude, it appears that a reasonable reserve of 80 billion barrels may be depended upon.—*G. W. Gleeson.*

NATURAL GAS: ON THE UPGRADE

The natural gas industry has been expanding at a prodigious rate. In 1945, total sales of natural gas in this country came to about 2,256 billion cubic feet. During the next five years consumption of natural gas increased by something like 70 percent—to 3,850 billion cubic feet.

That has meant that while we have been working with all our energy to get enough steel to complete essential natural gas pipeline projects, it has also been necessary to take steps to keep the gas markets from running completely away from the construc-

WAR & PEACE & PLENTY

"If the free world is to be strong in case of war and at the same time equal to the challenge of peace, we must gear our future to the economics of abundance."

WALTER P. REUTHER
President, UAW-CIO

tion of pipelines needed to bring the gas to the markets.

As a result, it was necessary on August 22 to issue a natural gas limitation order, which puts a "slow down" on the extension of natural gas service in 15 states and the District of Columbia. The sole purpose of this order was to insure maintenance of continued gas supplies for existing customers, and to protect defense industries.—*Oscar L. Chapman.*

NATURAL GAS: RESERVES

Natural gas reserves which are mainly located in about 2 percent of the petroleum producing fields are variously estimated at from 175 to 400 trillion cubic feet. In the immediate past, gas has been discovered faster than it has been produced, due to lack of pipeline facilities. Currently, gas is near the peak of withdrawal for optimum recovery, but there is every evidence that natural gas is being, and will be, consumed at an ever increasing rate, particularly for industrial power. There is no method of accurately estimating the probable period of useful life of known reserves since increases in rate of use is an unknown factor. At current rate of use, however, an outside expectancy of 65 years may be the order of magnitude. Most certainly, the actual period will be less than this figure. —*G. W. Gleeson.*

ATOMIC ENERGY: FINITE

Energy produced by nuclear fission has developed another concept of practically an inexhaustible energy source. This certainly is not true. The development of large scale atomic power will come slowly. As with any energy resource, it is dependent upon a fuel supply in the form of fissionable material which, like other fuels, is definitely limited in amount and vastly more expensive per unit weight, but undoubtedly competitive per unit of available energy.

It is pertinent to mention that, in one respect, atomic energy is unique. It is the only finite energy source which does not depend on a fossil fuel, and accordingly, uses the only fuel which is inorganic.—*G. W. Gleeson.*

. . . *Continuous Sources*

WATER POWER: POTENTIAL 6×10^{12} HP. HR.

The most completely developed of our continuous sources of energy is water power. In the minds of many, particularly the people in the favored northwest area, our water resources are considered all-important. Purely theoretical considerations of all rain-



Designed to handle loads of 500, 1000, or 2000 lbs., the Shepard Niles Lift-About Jr. electric hoist actually exceeds, in performance, that which customarily is expected from these lighter service hoists. And requires less maintenance in doing so.

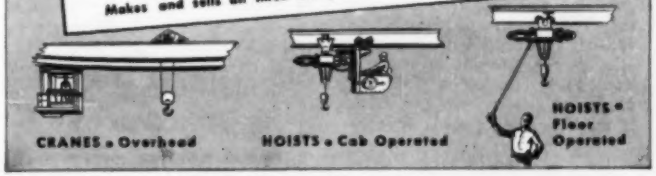
Two factors are responsible for such outstanding performance: one is a sound engineering background that comes from years of specialized experience. This is apparent in the design and construction of the hoist itself. The other is the Shepard Niles policy of making certain that the hoist you buy is the *right* hoist for *your* service. It is a policy that protects against buying a hoist that is too light for severe service. By the same token, it prevents investing more than necessary when lighter service *is* indicated.

If you would like help with your handling problems, write us. A Shepard Niles specialist will be glad to place our years' of material handling experience at your service.

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CRANE & HOIST CORPORATION

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Technical Topics

12-14% CHROME TYPE ALLOY

Norman S. Mott

Chief Chemist and Metallurgist

This composition is a mildly corrosion-resistant alloy capable of being heat treated for a variety of properties including high strength and hardness. It has a low coefficient of expansion, is tough, machinable, weldable, and finds extensive use in valve bodies, valve trim, pump parts, grinding units, etc., especially in power plants, oil refineries, and paper mills. The alloy has suitable corrosion resistance for applications involving superheated steam, hot oil, foodstuffs, and some neutral salts; however, it will rust to a slight extent in a moist atmosphere. Its low cost, high strength, high hardness and wear resistance, coupled with an appreciable amount of corrosion resistance, make it an ideal alloy for specific applications where these factors are of primary importance.

This alloy is supplied in three carbon ranges: under 0.15% C, 0.15 to 0.25% C, and 0.25 to 0.35% C, these being designated as CA 14S, CA 14I and CA 14H respectively. The carbon range selected depends upon the final degree of hardness desired as well as other properties. Increasing carbon up to 0.25% increases hardness appreciably in the quenched, and quenched and drawn below 900° F. condition. Above 0.25% the increase in hardness is slight and these higher carbon contents, unless the slightly greater hardness is very essential as in wear applications, are not generally recommended, as ductility and shock resistance are seriously lowered.

In the quench hardened condition this alloy has its best corrosion resistance. Drawing the quench hardened material at 600°F. increases the ductility and shock resistance without decreasing the hardness to any appreciable extent, and without any effect on the corrosion resistance. It also is very effective in eliminating hardening stresses and the danger of cracking, and so is highly recommended.

The best hardness range for machinability is 220-240 BHN. This range is best obtained by tempering at 1200° F. for under 0.15% C, at 1300° F. for 0.15 to 0.25% C, and at 1400° F. for 0.25 to 0.35% C. Softening to too low a hardness causes gumming and poor machinability; also it causes low maximum hardness upon rehardening.

Molybdenum in amounts of 0.4 to 0.6% is sometimes added to improve machinability and high temperature creep resistance. Copper is often added to the extent of 1.0% to improve corrosion resistance and is occasionally combined with molybdenum additions. Nickel in amounts of over 0.75% and silicon over 1.0% are to be avoided. Nickel greatly increases the hardness in the tempering ranges used for machinability and necessitates lengthy special heat treatments. Silicon has a very detrimental effect on impact resistance when the alloy is drawn at 600° F.

Heat treatment for all carbon ranges of this alloy consists of oil quenching or air cooling from 1800° F. after slowly heating to temperature and holding for one hour, followed by tempering for 3 to 4 hours at the correct temperature necessary to obtain the desired properties. Tempering temperatures of from 900–1100° F. are to be avoided as this range produces low corrosion resistance and mechanical properties. Oil quenching from the hardening temperature produces slightly higher hardness values than air cooling, but is not practical for large castings. A hardening temperature of 1900° F. will produce slightly higher hardness values upon quenching in the 0.25 to 0.35% C grade.

Available on request

Copies of this article in convenient filing form, and a table of mechanical properties for conditions of heat treatment most commonly used, are available. Address requests to Publicity Dept., The Cooper Alloy Foundry Co., Hillside, N. J.

COOPER ALLOY

ADVERTISEMENT

QED, cont. . .

fall of the earth (av. 36 in. per yr.) raised to a mean land elevation (2,400 ft.) and wholly utilized, would produce some 360 trillion horsepower hours per year. This is about 14 times our present total world energy requirements (about 12 trillion horsepower hours for U. S. or 24 for the entire world). Reliable engineering analyses indicate that perhaps not more than 6 trillion horsepower hours is a practical maximum which might ultimately be developed. Of this practical potential, only about 0.7 trillion horsepower hours is currently installed. The major virtue of hydroelectric power is the fact that it is a continuous source of energy, essentially free from the standpoint of consumption of our natural resources. As such, it should, in the public interest, be exploited to the maximum extent feasible.—G. W. Gleeson.

VEGETATION: LIQUID FUELS

The direct use of vegetable matter is difficult from an economic standpoint, primarily because of the labor involved in harvesting and the necessity of storage. We will probably make better use of wood as a fuel source after dependable supplies of waste wood accumulate at fixed locations. Regulated cropping of forest resources will develop these supplies.

Indirectly, the production of alcohol or other hydrocarbon materials from vegetable matter affords a field of exploitation which gives energy in transportable form as liquid fuel.

Subject to the priority of food crops, vegetable matter could, and undoubtedly will, be grown and converted to gas for conventional synthesis to gasoline and other hydrocarbons. From an economic standpoint, it would be more reasonable to convert wood into gasoline upon a strictly thermal basis. Much depends upon uses of alcohol for other than fuel, however, and, in addition, upon the use of lignin, waxes, and other byproducts of the wood sugar fermentation process. Both conversions of wood will undoubtedly play a distinct part in the future.—G. W. Gleeson.

SOLAR ENERGY: FEASIBLE

Even the small fraction of the energy we receive from the sum is 10^9 times our total energy requirement. About half of this intercepted radiant energy is reflected back into space by our atmosphere and another third of the remainder by the earth's surface. Part of the unreflected energy is fixed by plants and utilized in evaporation of water, and the remainder is reradiated at night. *(Continued)*



GLASS-TO-METAL BONDS must be strong and vacuum-tight for television picture tubes. Gas flames, impinging on the metal-glass surfaces, assure a dependable seal for Sylvania Electric Products Inc., Ottawa, O. and Seneca Falls, N.Y., picture tube plants.

Special Gas burners bring the temperature of the metal cone and the edge of the glass face to the proper temperature, allowing the glass to flow into the cone's spun-lip for an air-tight seal. To hold the proper face curvature and to prevent collapse, positive pressure maintained in the cone supports the face.

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QED, *cont. . .*

Effective utilization of solar energy is essentially a problem of preventing such re-radiation by trapping the solar radiation in some usable form.

It is quite possible, at very low efficiencies, to convert solar radiation to electrical energy via thermoelectric means and new alloys have recently raised efficiencies to as high as 5 percent. Likewise, photoelectric conversion holds definite possibilities. Primarily, however, solar energy potential is raised by optical systems and several such systems have been projected. High temperature production as well as low pressure power systems are a distinct possibility, and some estimates of costs and land areas involved, have been prepared. Night storage of solar energy and storage to meet peak demands are difficult but surmountable problems.

Other experiments with wind power, earth heat, tidal power and other continuous sources are being investigated. One or several of these may prove promising.—G. W. *Gleeson.*

G. W. Gleeson, Oregon State College, before the American Society of Heating and Ventilating Engineers, Portland, July 1951, and Oscar L. Chapman, Department of Interior, before the National Press Club, Washington, Oct. 4, 1951.

DESTRUCTIVE DISTILLATION

. . . *Fluidized Powder*

In order to assess the economics of distilling a particular kind of wood or coal by the fluidized powder technique, one must be able to put down numbers—quantities, pressures, power requirements, yields, etc. At the present time, experimental programs with the object of obtaining pertinent basic information are under way in at least two institutions, Georgia Tech and Stanford University.

The work at Georgia Tech has thus far been confined to small-scale experiments on the distillation of hardwood. One reason for this choice of raw material is the existence of a hardwood distillation industry in the South. In addition, when compared with other likely materials, hardwood seems to offer the fewest problems in laboratory manipulations and is hence a logical

POWER PLUS

"A gallon of gasoline properly consumed in an internal combustion engine yields more power than a gallon of TNT.

H. S. M. Burns, *President Shell Oil Co.*

choice for initial experiments. White hardwood is the only material that has been tried to date at Georgia Tech, the apparatus constructed for the purpose should be adaptable for experiments with other types of charge, and further work is being planned.

Preliminary results on hardwood are noteworthy in two respects: the discovery of an effective method for preventing the distilling particles from sticking to each other; and the achievement of substantially complete distillation in remarkably short times—of the order of 2 hr. at 400 deg. C. The preliminary data on yields are much less definite, since they depend on an estimate of the amount of solvents contained in the noncondensible gases; but it seems clear that the yields of wood alcohol and acetic acid at least equal and perhaps exceed those now obtained commercially.

More recent work on hardwood shows that the time of distillation can be reduced to as little as 30 min. at 400 deg. C. by means of a change in the setup, which has the effect of improving the degree of fluidization. A complete material balance on the process including a measurement of the non-condensible gases and recovery of the solvent vapors therein, discloses that the amount of solvent in the gases is less than originally estimated and that the total yield of wood alcohol and acetic acid obtained at 400 deg. C. is about the same as the yields reported for present commercial operations. Attempts are being made to run the apparatus for a sufficient time to accumulate a sample of tar large enough for an accurate and complete analysis. Such an analysis may indicate that the short reaction time characteristic of the fluidized powder unit has the effect of minimizing thermal decomposition of valuable constituents (many of which are probably unstable at distillation temperatures) and producing a richer tar than that from conventional retorts. However, in the absence of data on this point, the probable advantages of a fluidized powder unit for the distillation of hardwood appear to be economy of labor due to continuous operation and a reduction in the size of apparatus required for a given capacity.

At Stanford attention has centered on the distillation of redwood waste, disposal of which is a major problem of the lumber industry on the West Coast. Small-scale experiments have indicated that the yields of wood alcohol and acetic acid from redwood are low. However, the yields of other chemicals are so attractive that a unit has been constructed for further study on a pilot plant scale.

What is the present status of the



THE BRILLIANCE of the picture on your TV screen depends largely on the fine phosphor coating applied to the inside tube surface. In the large plants of one major television receiver manufacturer, achieving a perfectly smooth surface posed a persistent problem.

After many tests in a pilot plant setup, the cause was found to be in the water used for the phosphor mixture. A small Sparkler Model 8-3 Type 304 stainless steel filter was installed in the pilot plant line and it was suggested that Sparkler graded media be used with a precoat of a fine grade of diatomaceous earth. This proved to be completely satisfactory in every respect, providing excellent clarity (removing all particles of gum, resin and dirt down to one micron in size) and more than ample cycle length.

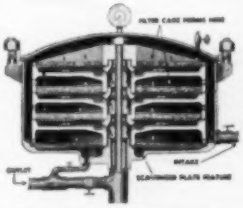


By keeping a spare cartridge on hand, down-time can be minimized. When cleaning is necessary, simply lift out the dirty cartridge and insert clean one. Filter is then ready for full production.

On the basis of pilot plant performance, the company subsequently selected the Model 18-W-18-2 dual unit for a total capacity of 2000 GPH of water as the most suitable for their operation. In all, five such dual units were ordered. Each dual unit is installed on the outlet end of a demineralizer and has consistently produced water of fine clarity and brilliant polish, thereby increasing the reproductive quality of this company's TV screens.

In hundreds of varying applications, Sparkler filters have demonstrated their ability to produce filtrate of the very finest quality under a wide range of service conditions. They are extremely flexible, easy to operate and service, can use any type of media, have high flow rates, and can be made of a complete range of materials.

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QED, *cont. . .*

distillation of wood and coal by the fluidized powder technique? Because of the small scale of the experiments and the small number of raw materials that have been tried, it is too soon to gauge the ultimate worth of the process to industry. However, the work thus far is encouraging. It offers hope for important economies in labor and materials. There are a number of indications that it may lead to the production of richer oils and tars. Finally, in the broad view, it may help us to be more efficient in our use of two major natural resources.

From *The Research Engineer*, bulletin of the Georgia Institute of Technology.

DEWAXING AGENT

. . . *Precipitator Solvent Couple*

H. Poell

With the combination of the wax precipitators 1,1-dichloroethane and 1,2-dichloroethane, a solvent-precipitation couple has thus been found for centrifugal dewaxing which must be considered fully equivalent to the solvent-precipitator couple acetone-benzene almost generally used for dewaxing with filtration; furthermore, it meets all the requirements for centrifugal dewaxing.

If properly applied, 1,1 and 1,2-dichloroethanes yield at every ratio of admixture a well crystalline, large-scaly paraffin wax precipitate which can easily and quickly be separated by either centrifuging or filtration. Dewaxing at extremely low temperatures does not present any difficulty as in these cases a further addition of 1,1-dichloroethane is sufficient to obtain a pure wax precipitate without selective secondary effect (slabby precipitation).

H. Poell, Technical University, Vienna, before the Third World Petroleum Congress, The Hague, The Netherlands, May 28–June 6, 1951.

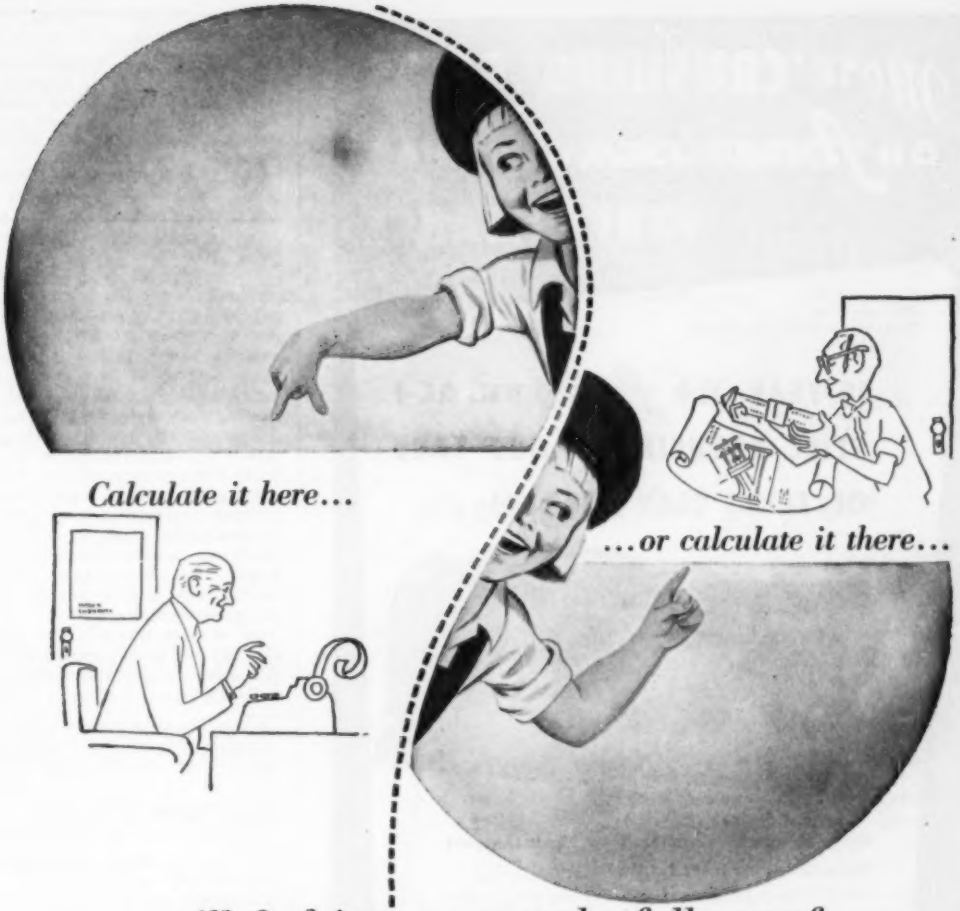
NEW WAX

. . . *Raw Materials Aplenty*

Joseph Reilly and Liam Mulcahy

Ireland's tremendous peat deposits represent an important natural resource aside from their value as fuel. One of the most valuable of all the potential byproducts of peat is a wax which has a relatively high melting point and has been found to be promising from a technical standpoint.

The wax contains approximately 50



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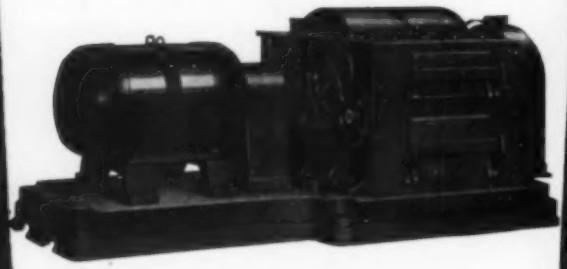
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H. S. M. BURNS, *President Shell Oil Co.*

QED, *cont.* . .

percent of a complex bitumen material, 35 percent of peat esters and 15 percent of resin, has been given the name Mona wax. Processing produces waxes varying in color from dark brown to white and also produces some changes in physical properties.

Approximately one-fifth of the land surface of Ireland is made up of peat land. These millions of tons of peat are of great chemical interest because the peat comprises a large mass of complex chemical organic substances which may provide cellulose products, humic acid, fermentable carbohydrates, waxes, peat tar and tar oils as well as combustible gases.

All of these materials, however, are of a very low grade, and this presents difficulties in developing them industrially.

Joseph Reilly and Liam Mulcahy, University College, Cork, Eire, before the International Congress of Pure and Applied Chemistry, New York, Sept. 11, 1951.

ORE FROM PYRITES

. . . *With Byproducts*

A. Scortecci and M. Scortecci

The authors have done considerable work on the dissociation of pyrites in the absence of air, and in the presence of carbon, with the formation of iron and carbon bisulphide.

Tests have indicated that a plant of industrial size could be constructed with equipment that is standard in present day metallurgical and chemical industries.

Most recent tests have been conducted with a tilting arc furnace holding 65 lb. of charge.

The rate of the analyses of the iron obtained in these last experiments is 4.2 to 4.5 percent total carbon; 0.72 to 2.7 percent combined carbon; 1.20 to 0.60 percent Mn; 0.60 to 2.35 percent Si; 0.03 to 0.04 percent P and 0.81 to 1.50 percent S.

Silicon sulphide and flake graphite (the latter in amounts up to 8 percent of the cast iron), were found in the dust collector of the furnace.

Iron yields in the most recent tests have been higher than 95 percent.

Sixty percent of the sulphur is recovered as carbon bisulphide or sulphur. Losses are attributed to (1) leaks in the experimental equipment with consequent formation of oxysulphides; (2) to the formation of silicon sulphide from silica in pyrite gangue and in coke ashes; (3) to the formation of small amounts of sulphides by the other metallic elements in the pyrites; (4) to moisture in the charge —which forms H_2S and oxysulphides, and to the dusting of FeS during the early stages of FeS_2 dissociation.

The process appears economically feasible on the basis of present prices of raw materials and power, but such calculations are necessarily open to error.

Any byproduct sulphur would have an immediate market under present conditions. On the other hand, the amount of CS_2 obtained with even a modest production of iron would exceed the present market. This could be side-stepped by burning the CS_2 in a limited amount of oxygen, thus producing elemental sulphur, or by developing organic products derived from CS_2. The latter possibility is favored by the large free energy of carbon bisulphide, comparable with that of hydrocarbons.

Graphite, also obtained as a byproduct, would find a ready market in several industries.

A. Scortecci and M. Scortecci, Finsider Metallurgical Institute, Genoa, Italy, before the National Metals Congress, Detroit, Oct. 15, 1951.

RESEARCH MANAGEMENT

. . . How to Get There

Earl P. Stevenson

Personal characteristics influence the growth of a man toward a position in research management as much as his technical ability. However, unless his technical knowledge is sufficient to gain the respect of his associates he cannot be particularly successful in top management. Thus one is forced into selecting men whose technical ability is not looked down upon by the men in the laboratories, shops or engineering departments, and whose leadership qualities are well recognized.

These qualities are to a real degree born in people and it is astounding how one can obtain quite universal agreement within an organization as to which few men have what it takes to manage a large endeavor. Thus the process is to select, by observation and careful discussion throughout the organization, the individuals who possess these unique qualities and cultivate them.

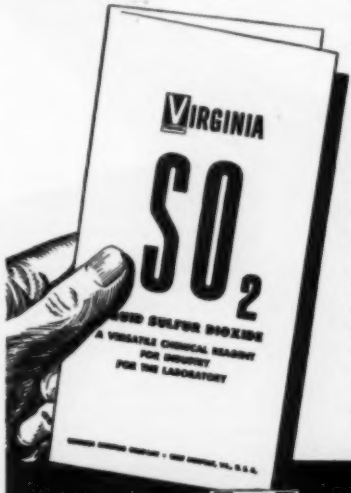
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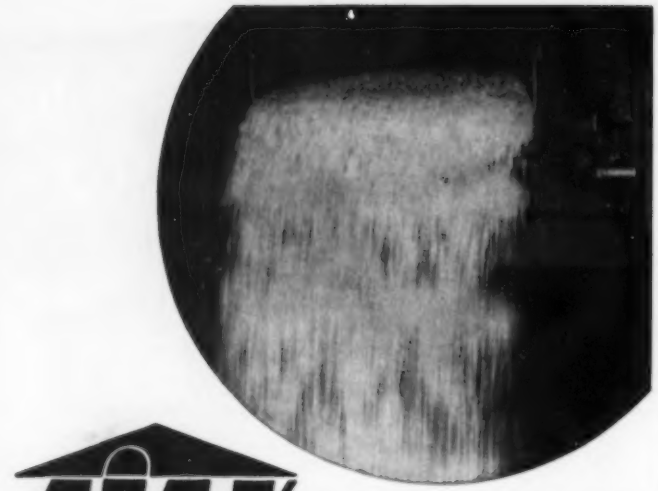


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QED, cont. . .

are rather standard and include such things as proper incentives, encouraging participation in technical societies and preparation of papers, bringing them into planning and program meetings, introducing them into various parts of the organization for broader understanding, giving them close contact with superiors, and the like.

These conditions prevail in many companies, but often action is not taken soon enough so that the really outstanding people may get restless and leave or, worse still, lose much of their original interest and drive. Thus the secret is to follow the careers of the promising men continually and give them their head as expedient to permit their development at a pace consistent with their abilities and energy. Naturally, one has to be careful not to ruin a man in the eyes of his fellow workers by too rapid promotion, but to time things so that his associates approve his advancement.

In my opinion, the first requirement for a manager is good judgment. How do you develop this quality? I don't believe you can by any curriculum in college or by any prescribed course of training. However, I am certain that it can be developed by experience and hard work, of course, in varying degrees according to individual characteristics. Clean living, and a proper sense of values enter into the equation somewhere, as do ambition, a willingness to work harder than average, to put more into the job than is required, to be observant and tolerant of opposing ideas and personalities.

But to inject a foreign note into this paper, it may be an act of good judgment on the part of an individual to write off all managerial aspirations beyond the minimum required for those activities which he most enjoys and from which he derives the greatest sense of accomplishment. Everyone of us is a manager, so to speak, in his own right. We have to order our own lives and usually those of a few close associates at home or at work. My point is that many a good research worker or engineer has been sacrificed by a poorly advised move into a management position.

Another important point for the engineer with management aspirations is attention to personal habits. Even mannerisms may be determining. Little things are often indicative of larger virtues or deficiencies. A lack of consideration for others may be read into a failure to conform to the custom of those with whom you associate. I am sure that poor social habits—yes, even such little things as table manners—have stood in the way of advancement

to management assignments more often than lack of ability along technical lines. Those who would use their technical or scientific education and training as a stepping stone to management would be well advised to observe the social amenities of those with whom they must necessarily associate.

Earl P. Stevenson, Arthur D. Little, Inc., before the American Institute of Chemical Engineers, April 18, 1951.

CORROSION

. . . By Steel "Termites"

Probably the most novel corrosion problem in the annals of the National Association of Corrosion Engineers was the case of the anaerobic bacteria which caused holes in steel pipes a mile below ground. It took seven years of exhausting the possibilities before the culprits were discovered. Here's how it happened:

Shell Oil Co. discovered that the steel pipes which lined its oil wells in the Ventura (California) field were leaking. Holes in the ¾ in. casing threatened to ruin the wells by allowing gas and oil to escape and by letting in salt water from rock strata above the oil deposit.

The engineers assigned to find out the whys of the leaks suspected: (1) mechanical failure; (2) salt water; (3) chemicals in the soil; (4) galvanic corrosion; (5) practically anything within reason. Nothing checked.

Then the engineers got a break. They managed to get a look at a sample of corroded casing. From the pitted area they scraped off some black scale, analyzed it.

It contained 6 percent ferrous sulphide. How did it get there? Sulphate was present in the rock but what was changing it to sulphide—without oxygen?

A search of the corrosion literature found the culprit. A species of anaerobic bacteria was able to change sulphate to sulphide which ate into the steel. The bacteria had gotten into the mud used in drilling. Increasing the alkalinity of the pH of the mud killed off the bacteria, and the problem of drilling new wells was solved.

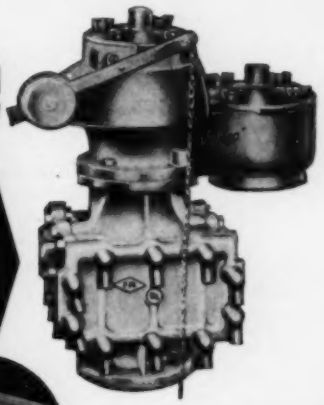
The problem of the existing wells has not yet been disposed of but one suggestion is the sending of huge charges of electricity down the casing to electrolyze the salt water surrounding it and thus raise the pH enough to kill the bacteria.

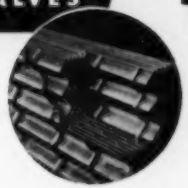
From the Oil & Gas Journal, June 14, 1951, p. 69.

—End

WHEN STORING FLAMMABLE LIQUIDS IT PAYS TO BE

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"VAREC" Fig. No. 5800 Vent Unit consisting of "VAREC" Conservation Vent Valve in combination with "VAREC" Flame Arrester.

The belief that conservation vents or breather valves alone will prevent travel of flame back into flammable liquid storage tanks is questionable because of the many contributing factors. Careful authoritative analysis reveals that valves by themselves do provide *some protection* but this "protection" *is by no means adequate* under all circumstances.

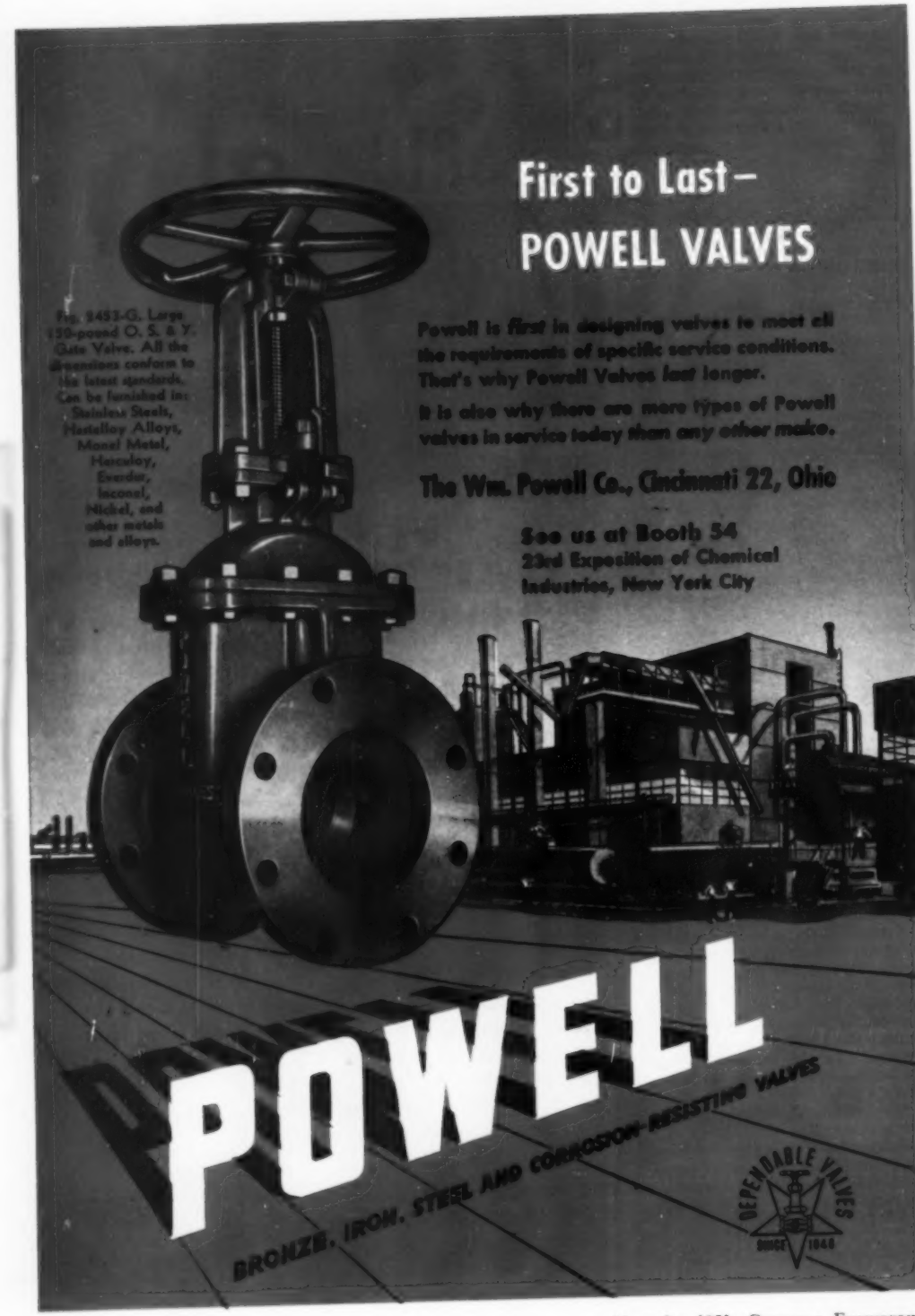
Safety authorities emphatically advise that "vent valves are not regarded as providing the required protection against fire and explosion." A textbook on safety states that "a conservative policy is to provide flame arresters in conjunction with other vent equipment on all cone-roof atmospheric tanks handling oils with a flash point up to 200°F open cup."

"VAREC" Flame Arresters when used as a unit with "VAREC" Vent Valves give you full fire protection at extremely low cost. Average installations run approximately .1 of 1% of your investment in tank and products. Consult your nearest "VAREC" representative or write for further information.

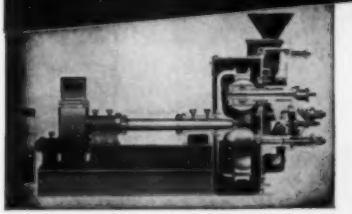
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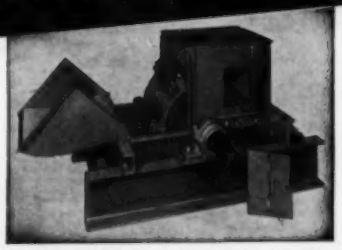
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BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES
DEPENDABLE VALVES
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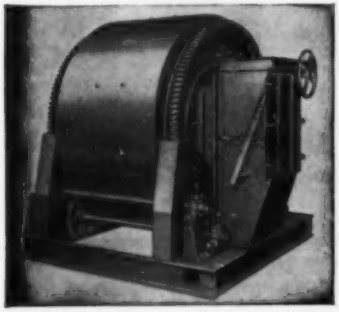
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RING ROLL MILL — for medium and fine reduction of hard or soft materials (10 to 200 mesh). Open-door accessibility for easy cleaning. Available in many sizes and capacities.



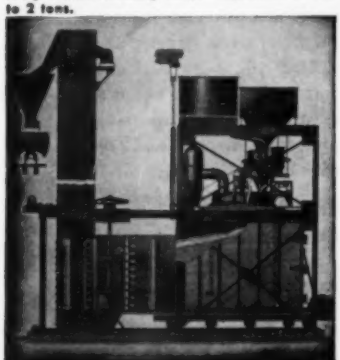
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Sturtevant Processing Equipment . . . Grinders, mixers, separators, screens, etc. . . . can help you *reduce* today's high manufacturing costs by increasing both machine and operator output, lowering production costs, assuring high quality products.

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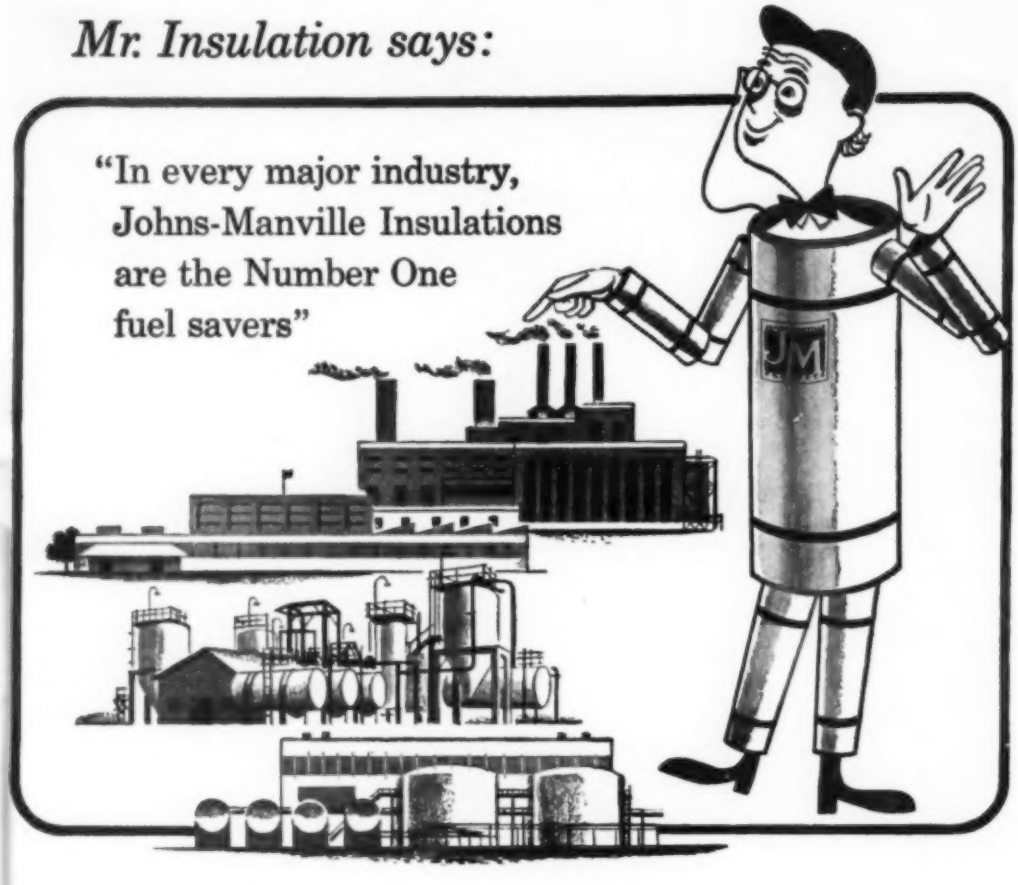
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How You Can Avoid a Lot of Headaches

Anticipate trouble. Lock the barn door and you will keep your horse. Know your chemicals and keep your health. Know how to ship and you keep your customers.

Nobody has to tell you that it pays to know as much as possible about any material you are working with. But we forget, just as did a young plant chemist. He ruined a pair of rubber-soled shoes by walking in spilled trichloroethylene. He knew better. But it is just this sort of carelessness that often costs more than a pair of shoes.

We forget. We also assume. Wouldn't you assume that acacia wood is perfectly safe to handle? Wrong. This substance is the very first entry in a just-published guide to the safe handling and safe shipping of some 5,000 materials.* In it we learn that acacia wood "may cause irritation of the eyes and upper respiratory passages." We learn that goggles and a respirator are standard safe practice.

Let's stop forgetting. Let's stop assuming. Let's make a quick check of the materials we meet every day. Let's get a little increased respect for our products, byproducts and raw materials. A mighty fine place to begin is with Sax. He tells us what the hazardous properties are. He tells us how to store and how to handle the everyday chemicals we meet and the rarer ones we run into once in a while. It will pay you to review the familiar, to check the new.

You know that some of our materials may be toxic, noxious, irritating or otherwise unpleasant. In addition, many of them are combustible, flammable or explosive. Sax gives the lowdown on these properties too.

By consulting this dictionary-like handbook you can lock the barn before the horse disappears. By learning the possibilities of injury—to people and to plant—you can work more safely. Don't be a menace to yourself or to others.

But, in spite of all our watchfulness and care, trouble does strike. And when it does you will be at least partially prepared if you have studied Sax. Not only does he list treatments and antidotes for incidents involving a particular material or chemical, he also lists usable extinguishing agents. And you want to be ready.



N. I. Sax
From RPI to GE to AEC

There is another reason why you should consult Sax before emergency makes you wish you had. It is vocabulary. Some of the directions he gives are doctors' talk. You will want to know beforehand so you can translate and evaluate such things as "single oral dose causing LD50 for rats after 14 days' exposure is 4.24 to 4.92 g/kg of body weight." Or this: "It can cause keratoconus and extensive corneal necrosis (experimental)."

Unquestionably the Sax handbook is a real contribution to safe practice. But this vocabulary trouble is a weakness. Are you sure you know the meaning and significance of, "It is an excellent lipoid solvent?" Or "It can cause acute yellow atrophy." Or "It can cause iritis."

It seems as if the author could have translated and evaluated some of his source material without losing effectiveness, authority or accuracy. Perhaps the book needs a glossary. From page 1 up to and including page 3 we run into such terms as conjunctival, cyanosis, intraocular, necrosis, keratoconus.

The book has been compiled from so many sources that it is uneven. This is another reason for pre-disaster study. For example, speaking of one chemical, it "does not cause severe burns upon contact with the skin." But further along, ". . . in contact with the skin, it can cause burns." Apparently acetic anhydride does burn, but does not cause severe burns.

Again for example, "If breathing has stopped, artificial respiration should be started at once. If oxygen is available it should be administered and a physician called." What this unintentionally says is, "If breathing has stopped, artificial respiration should be started. Don't call a doctor if oxygen is unavailable."

Pre-disaster study will remove shock, too. What would you do in a case like this: Somebody has been poisoned by aconite. You grab the Sax handbook for help. It says, "Empty, then wash the stomach with tannic acid or powdered charcoal." Directions could have been more specific. Agree? The book does not have a section of first-aid instructions which could include directions for artificial respiration, stomach washing and other instructions that are needed only when they are needed badly.

Irving Sax, a RPI graduate, has been toxicologist with General Electric for 11 years. There he acquired the background so necessary for and so evident in his handbook. Last month he moved from Schenectady to New York and a new position with the Atomic Energy Commission.

Facts From Sax . . .

Whisky is a flammable liquid and a dangerous fire hazard.
There are no shipping regulations on welding fumes.
Coffee has been known to cause temporary blindness.
Acetylene tetrachloride is the most poisonous halogenated hydrocarbon.
Erosio interdigitalis blastomycetica is an intertrigo-type infection.
After five half-lives only 3.1 percent of original activity will remain.
Ethylene glycol will cause paresis of the abducens nerve.
There is nothing that can be done to a radioactive material that will change the characteristics of its radiation.

* HANDBOOK OF DANGEROUS MATERIALS. By N. Irving Sax assisted by W. W. Schultz and M. J. O'Herin. Reinhold Publishing Corp., New York. 848 pages. $15.

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Author Sax is proud of his book. And, although he is a toxicologist, the feature he likes most is the shipping information and instructions. Under each entry, where necessary, are given the requirements for labels, maximum allowable lots, and a reference to the ICC Shipping Regulations. And the whole book of regulations has been included as a fifth section of 223 pages in the handbook. Sax justifies this by pointing out that one can never find a copy of the ICC regulations when it is needed. And when buying a new copy, it is at least a month away.

There are three more sections: Explosives; Fungus Diseases and Fungicides; Radiation and Radiation Hazards. They are all unquestionably dangerous. These three sections are valuable contributions on important subjects. In many spots they are really interesting and informative reading. But are they fish or fowl? They are too long and comprehensive for a handbook. They are too short for separate books. They are little monographs written by experts for experts.

The section on explosives occupies 56 of the book's large pages. It is a reprinting of some government and military reports and manuals. It covers (1) surface storage—including many magazine construction details, (2) destruction of explosives, (3) chemical ammunition and miscellaneous explosives, (4) high explosives, (5) low explosives.

A number of fungus diseases are occupational hazards. They appropriately belong in the handbook. Fungicides—from acetanilide to zinc oxide—are hazardous materials. Author M. J. O'Herin includes a list of fungicides with hazards and uses and with many cross references to the main section of

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RECENT BOOKS RECEIVED

Corrosion Guide. By E. Rabald. Elsevier. $12.50.

An Elementary Text in Hydraulics and Fluid Mechanics. By R. W. Powell. Macmillan. $4.75.

Industrial Furnaces. Vol. I. By W. Trinks. Wiley. $10.

Manpower Resources and Utilization. By A. J. Jaffe & C. D. Stewart. Wiley. $6.50.

Microbial Decomposition of Cellulose. By R. G. H. Siu. Reinhold. $10.

Mineral Oils. By K. Van Nes & H. A. Van Westen. Elsevier. $9.

Organic Syntheses. Vol. 31. Ed. by R. S. Schrieber. Wiley. $2.75.

Phase Microscopy, Principles and Applications. By A. H. Bennett. Wiley. $7.50.

Principles of Weed Control. By G. H. Ahlgren, C. C. Klingman & D. E. Wolf. Wiley. $5.50.

Statistical Methods for Chemists. By W. J. Youden. Wiley. $3.

The Surface Chemistry of Solids. By S. J. Gregg. Reinhold. $8.50.

X-Ray Analysis of Crystals. By J. M. Bijvoet. Interscience. $6.50.


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SPECIALISTS IN THE FABRICATION OF BULK AND FIELD STORAGE TANKS—HEAVY PLATE WORK OF EVERY DESCRIPTION

the handbook. In this section, too, the vocabulary interferes. A table of fungus diseases in industry is so complete that it includes bird fanciers, children, drug addicts and expectant mothers as occupations.

Radiation hazards are not new—just more prevalent. They, too, deserve space in a handbook which intends to cover dangerous materials. Because of the nature of the subject, much more than half of Author Schultz' discussion is devoted to theory and 24 pages of nuclide charts before he can get around to body shielding, decontamination and waste disposal. —*LBP*

Biochemical Lever

PHYSICAL BIOCHEMISTRY. Second edition. By Henry B. Bull. John Wiley & Sons Inc., New York. 355 pages. $5.75.

Reviewed by F. C. Nachod

When Professor Bull's "Physical Biochemistry" first appeared in 1943 it quickly found many friends. Now after eight years and considerable rewriting and bringing the subject matter up-to-date (the literature is covered up to 1950) the second edition is available. Fortunately the size of this extremely useful text has not increased to any extent (only 8 pages over the old edition) as older material has been discarded. By addition of new sections on problems and questions at the end of each chapter, the book has now gained additional usefulness as a text on the graduate level without losing its appeal for the industrial biochemist. Anyone interested in the application of physico-chemical levers to medical or biological problems should have a copy of Dr. Bull's treatise on hand.

Assumed Familiarity

PHYSICAL CHEMISTRY OF LUBRICATING OILS. By A. Bondi. Reinhold Publishing Corp., New York. 380 pages. $10.

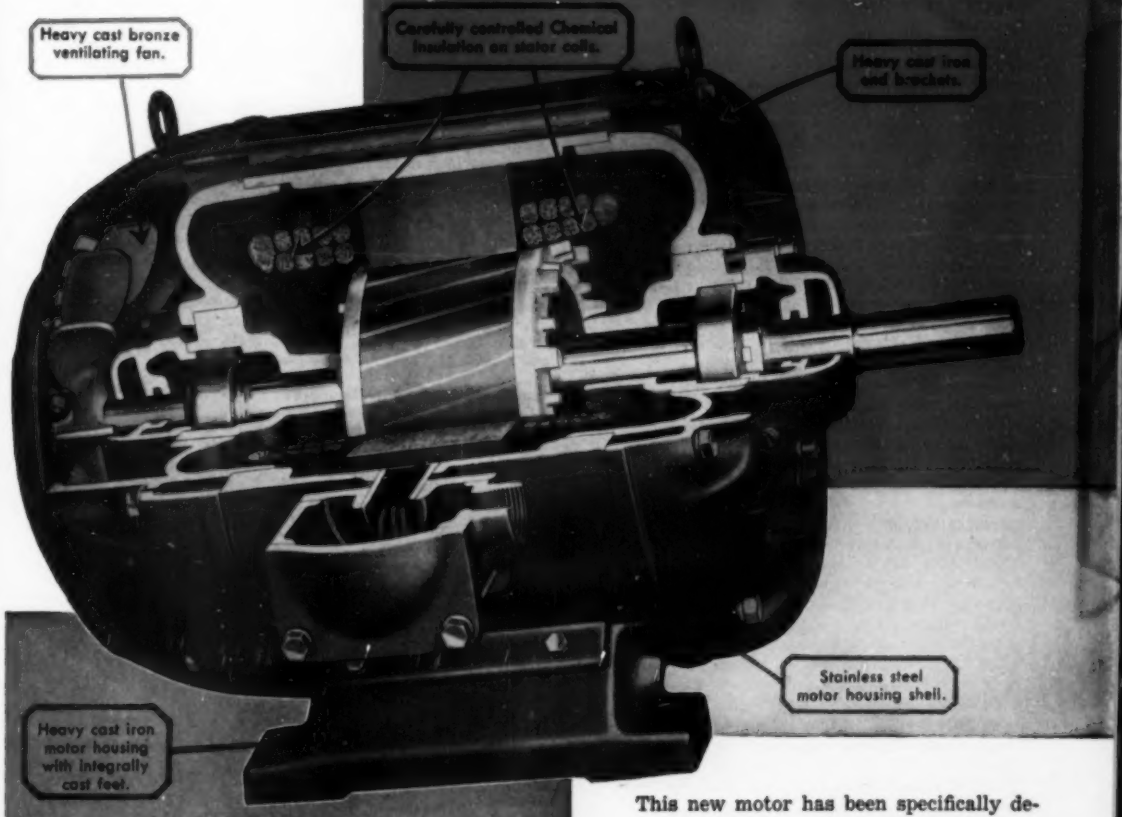
Reviewed by V. A. Kalichevsky

The book deals with the various aspects of physical chemistry of lubricating oils including oxidation phenomena. The text is divided into 70 topics with eight chapters.

Chap. I (18 pp.) deals with P-V-T relationships describing the nature of the liquid state, density, coefficient of expansion, compressibility, P-V-T diagrams, velocity of sound, absorption of sound, ultrasonic radiation, and thermal conductivity. *(Continued)*

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This new motor has been specifically designed and constructed to withstand the corrosive conditions encountered in chemical plants, oil refineries, and other similar operating conditions.

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Chap. II (82 pp.) is the most complete and describes briefly methods of viscosity measurements, theory of viscosity, viscosity-temperature relationships, viscosity and chemical structure, anomalous flow of liquids, and lubrication theories. Chap. III (67 pp.) discusses surface and interfacial tension, adsorption, spreading of liquids on surfaces, properties of adsorbed layers, boundary lubrication, rust preventives and deflocculation phenomena. Chap. IV (41 pp.) includes color measurements, nature of coloring substances, ultraviolet, infrared and Raman spectra, fluorescence, refractive index and refractive dispersion, optical rotation, magnetic properties, Kerr effect, Maxwell effect, photochemistry and electric properties. Chap. V (34 pp.) is devoted to the hydrocarbon type analysis of lubricating oils.

Chap. VI (28 pp.) contains discussions of vapor-liquid equilibria, solubility, solubility of wax in lubricating oils, solubility of oil in liquids, solubility of liquids in lubricating oils, and solubility of gases in oils. Chap. VII (64 pp.) on the broad field of reaction kinetics comprises oxidation, catalysis, inhibition, physical properties of oxidized oils, practical significance of oxidation tests and miscellaneous reactions (cracking and hydrogenation). Chap. VIII (41 pp.) follows the general pattern of the previous chapters as applied to synthetic lubricants. The book contains 766 references.

The book assumes a considerable familiarity on the part of the reader with the subject matter. It covers some of the recent literature which appeared since the publication of standard treatises like those of Barr on viscometry, Hersey or Norton on lubrication, or Sachanen on chemical composition of petroleum. Theory of the liquid state as developed by Dean Eyring is a basis of much of the discussion. Theoretical approach generally predominates. Short space devoted to the individual subjects often limits the discussion to an expression of opinion instead of presenting controversial viewpoints. For instance, the subjective concept of color is practically disregarded and only the physical concept is stressed. The statement that extreme petroleum fractions like gasoline and lubricating oil usually show volume expansion on blending might have been elaborated upon because the little exact information available on this subject shows that contraction takes place on mixing butane and crystal oil.

Recent Books & Pamphlets

Subject	Summary	How to Order
Agglomeration	Comprehensive roundup of agglomeration techniques and equipment. Four illustrated sections cover compacting by pressure, extrusion of plastic masses, spheres formed by tumbling, sintering. 14 pages.	Reprint No. 182. Editorial Dept., *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y. 35 cents.
Alcohol	Salient economic and statistical information on uses, consumption, U. S. production, imports and exports, tariff status. Background facts bearing on the outlook for supply and demand in the period immediately ahead. 50 pages.	"Ethyl Alcohol (Industrial Alcohol)." Industrial Materials Series Report No. M-1. U. S. Tariff Commission, 8th and E Sts., N.W., Washington 25, D. C. Gratis.
Plastics	Encyclopedia includes a 100-page buyers' directory, series of charts giving physical and chemical properties of plastics materials. There are chapters on the latest plastics machinery, engineering methods, new plastics materials. 636 pages.	"Modern Plastics Encyclopedia and Engineer's Handbook, 1951." Modern Plastics Inc., 575 Madison Ave., New York 22, N. Y. $2.
Seamless Tubing	Its evolution into its present place in the steel industry. History of its invention, development of the product, biographies of the varied and interesting personalities involved, an outline of contemporary mills and how they developed into their present form. 285 pages.	"The Seamless Story." By J. Pere Boore. Commonwealth Press, Inc., 1507 DeLong St., Los Angeles 15, Calif. $5.75.
Dutch Chemicals	A complete list of all Dutch chemical and pharmaceutical plants, their locations and products. An alphabetical list of all products translated into English, French, German and Spanish. 387 pages.	"Nederlandse Chemische En Pharmaceutische Producten." Second edition. Bedrijfsgroep Chemische Industrie, 2 Javastraat, The Hague, Holland. Price, f 11.
Water	Problems in the field of water law. Summary of the laws providing for the acquiring of water rights in the different States. 30 pages.	"Water Law With Special Reference to Ground Water." By C. L. McGuinness. Circular 117, Geological Survey, Washington 25, D. C. Gratis.
Patents	Written for the inventor and employee of a chemical process plant: what a patent is; steps which must be taken to protect an invention; how a typical patent department of a company operates and its relation to the inventor-employee. 44 pages.	"Patents for Technical Personnel." By Worth Wade. Chemonomics, Inc., 400 Madison Ave., New York 17, N. Y. $3.
Shale Oil	How Australia has been producing motor gasoline and allied products on a commercial scale from native oil shale. 48 pages.	"Oil-Shale Operations in New South Wales, Australia." By A. J. Kraemer and H. M. Thorne. RI 4796, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.
Packaging	Directory covering makers of all types of packaging machinery. Two sections contain (1) listing of various types of equipment and the names of manufacturers and (2) alphabetically arranged names and addresses of equipment makers and complete information on the machines each one makes. Loose-leaf.	Packaging Machinery Manufacturers Institute, 342 Madison Ave., New York 17, N. Y. $10.

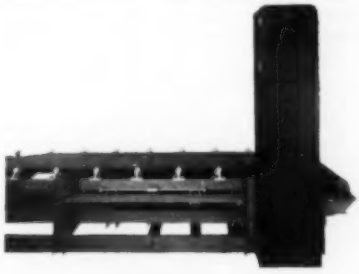
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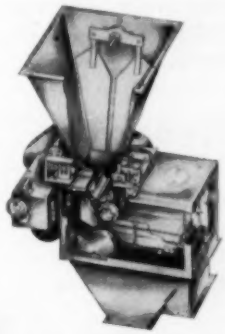
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Subject	Summary	How to Order
Water	Solutions to problems in groundwater hydrology relating to the rate at which the rock formations will supply water to wells in specified areas, perennially. 46 pages.	"Outline of Methods for Estimating Ground-Water Supplies." By O. E. Meinzer. Dept. of the Interior Water-Supply Paper 638-C. Superintendent of Documents, Washington 25, D. C.
Iodine	A survey of the physical and chemical properties of iodine and its compounds with emphasis on some of the unusual ones. Suggested applications are discussed to illustrate the variety of fields in which these properties may be utilized. 74 pages.	"Iodine, Its Properties and Technical Applications." Chilean Iodine Educational Bureau, 120 Broadway, New York 5, N. Y. Gratis.
Beta Rays	Collection of original reports from the most extensive set of investigations to date on the effects of beta rays applied to the surface of the mammalian body. 242 pages.	"Biological Effects of External Beta Radiation." By Raymond E. Zirkle. National Nuclear Energy Series, Manhattan Project Technical Section. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. $3.25.
British CPI	Nine recent papers presented before the institution. Sampling of dust-laden gases, liquid-liquid extraction, thermal economy in distillation are some subjects covered. Includes annual report for the year 1950. 160 pages.	"Transactions of the Institution of Chemical Engineers." Vol. 29, Part I. Institution of Chemical Engineers, 56 Victoria St., Westminster, London, S.W. 1, England. 12s. 6d.
Instruments	Latest revision of standards for screw thread gages and gaging. Presented in chart form. 86 pages.	"American Standard Screw Thread Gages and Gaging." ASA B1.2-1951. American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. $4.
Civil Defense	Examination of what has been done by Congress to further civil defense. Recommendations for future action. 26 pages.	"Civil Defense Legislation in the Atomic Age." By M. S. Levine. New York Committee on Atomic Information, 39 Broadway, New York 6, N. Y. $1.
Organics	Complete statistics on production and sales during 1950 of synthetic organic chemicals are summarized in final form by U. S. Tariff Commission as one number of their annual series.	"Synthetic Organic Chemicals, United States Production and Sales, 1950." U. S. Tariff Commission Report 173, Second Series, Superintendent of Documents, Washington 25, D. C. 45 cents.

—*End*



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Fig. 2308—Small Flush Bottom Tank Valve. Disc rises into tank to open valve. Sizes ⅜" to 3", incl. Also available with disc lowering into valve to open (Fig. 2310). Sizes ½" to 3" incl. Other designs are available in sizes 4" to 8", incl.



Fig. 1832—200-pound Stainless Steel Gate Valve. Screwed ends, screwed-in bonnet, inside screw rising stem. Available in many other corrosion-resisting metals and alloys.

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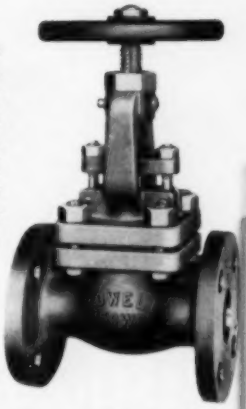


Fig. 2475—150-pound O. S. & Y. Globe Valve with flanged ends. Stem is threaded and guided through a bushing screwed into upper yoke. Plug type disc and seat can be easily reground, if necessary. Bolts and nuts are in Stainless Steel. Compression lubricant fitting in upper yoke. These valves conform to all the latest standards. Available in a large selection of corrosion resisting metals and alloys. Also made with screwed ends.

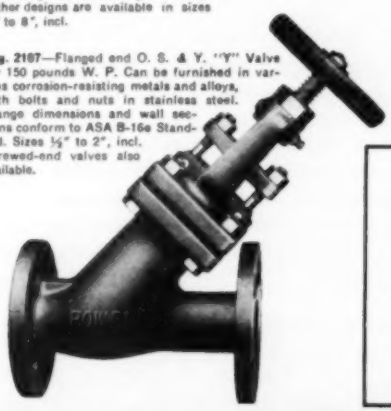


Fig. 2107—Flanged end O. S. & Y. "Y" Valve for 150 pounds W. P. Can be furnished in various corrosion-resisting metals and alloys, with bolts and nuts in stainless steel. Flange dimensions and wall sections conform to ASA B-16e Standard. Sizes ½" to 2", incl. Screwed-end valves also available.

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*Powell Corrosion-Resisting Valves are made in these Metals and Alloys

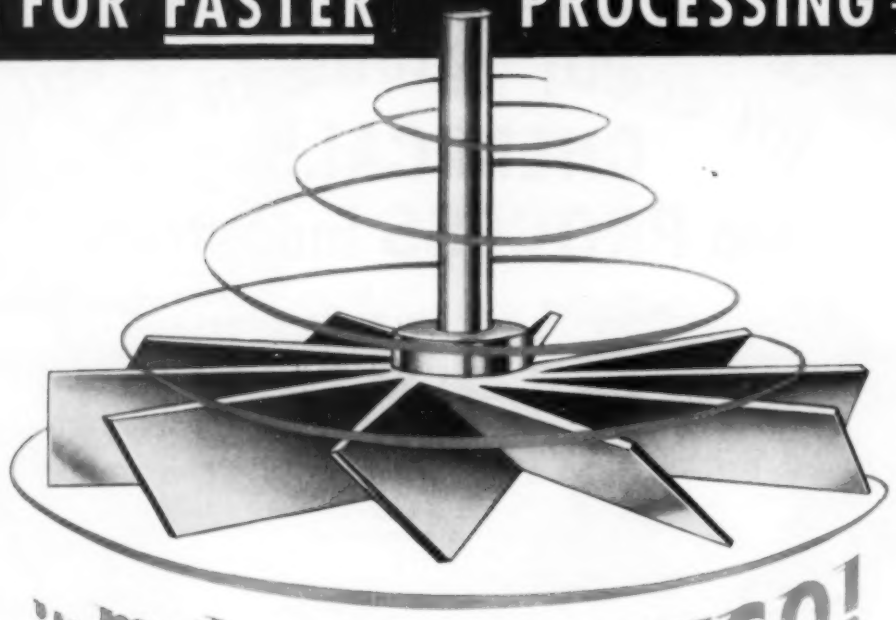
Stainless Alloys	Cast Irons	Nickel and Nickel Alloys	Bronzes—Acid, Aluminum, Silicon	Alloy Steels
18-8S	Cast Iron	Nickel	Everdur	Carbon Steel
18-8S Mo.	3% Nickel Iron	Monel Metal*	Herculoy	4-6% Cr. 5% Mo.
18-8S Cb.	Ni-resist*	Inconel*	3.5% Nickel Steel	
Misco "C"		Hastelloy Alloys†	Ampco††	6-8% Cr. .5-.75% Mo.
Durimet 20	**Aluminum**	(A, B, C and D)	Ampcoloy††	8-10% Cr. 1.1-1.5% Mo.
11.5-13.5% Cr. Iron	Alcoa No. 43	Illium	76	
18% Cr. Iron	Alcoa No. B-214	0-10	90-10	**Silver Hard Lead**
28% Cr. Iron	Alcoa No. 61 S-T		88-10-2	
25% Cr. 12% Ni.				**Molybdenum**

*Registered trade-names of the International Nickel Co., Inc.
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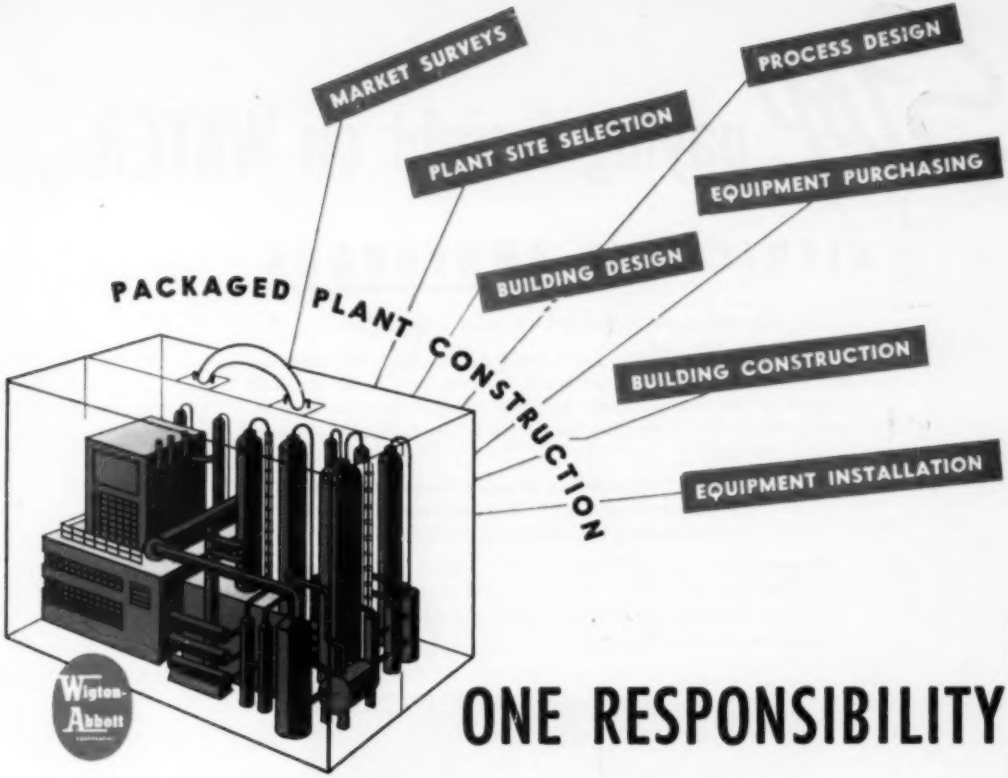
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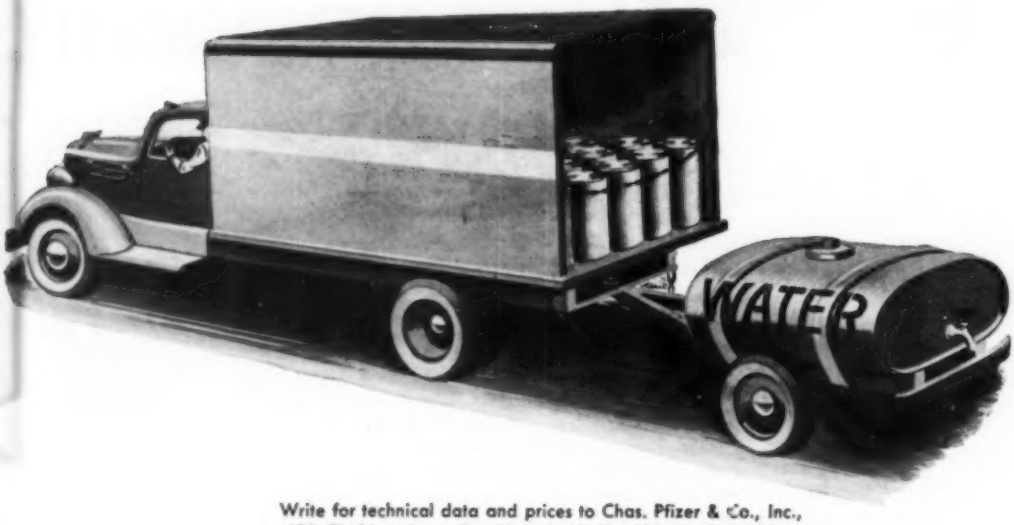
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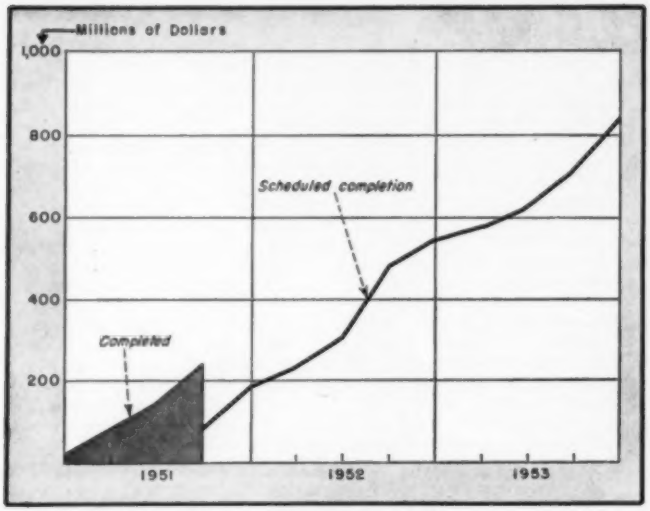
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Chemical Industry Gains Ground

Although the defense program is set for a breakthrough in '52 as retooling nears completion, the chemical industry is gaining ground and will be set for its own in '53.

Despite some production delays, the United States defense program is forging ahead in spectacular fashion. This is the keynote of the latest report submitted to the President by Director of Defense Mobilization Charles E. Wilson.

And the chemical process industries have contributed to the military effort by pushing ahead on the mobilization targets assigned to them.

By the end of this year nearly $100 billion will have been appropriated for the defense program. This total includes the program of military aid to nations abroad. To date, the value of military production is $14 billion. The annual rate of deliveries rose to $20 billion during the third quarter. A year hence this rate will zoom to more than $40 billion.

But right now the mobilization program is just getting well under way.

The guts of the drive to boost military output is the expansion of basic industrial facilities. The rate of private plant construction in manufacturing industries is double that of a year ago.

This combination of military production and plant expansion makes it clear that the metal-using industries face their period of greatest stringency. Industry requests for various types of steel, for aluminum, and for copper during the fourth quarter exceed the available supply by 50 to 100 percent.

Mr. Wilson's report indicates that, in contrast to the metal situation, the chemical process industries are in good shape.

Here are some industry details from Mr. Wilson's report.

Chemicals: Nearly $665 million in new facilities had been certified for fast tax write-offs through the first half of this year. One fourth of these new facilities is complete with equipment in place.

Peak expansion has been in facilities for inorganic industrial chemicals. Ammonia and chlorine plant construction is being pushed to meet military needs. And expanded agricultural production has put pressure on fertilizer manufacturers to boost output.

The big problem in chemicals, of course, is to get adequate supplies of basic materials such as sulphur and benzene. According to Mr. Wilson, there will be a 10 percent addition to present sulphur output by 1953. This welcome boost to present yields is due to the fact that new deposits discovered near New Orleans are expected to provide 500,000 tons annually.

But official opinion is that sulphur shortages are likely to run from 500,000 to 1 million tons a year for the next two years.

Petroleum: This industry is in the midst of an estimated $1 billion expansion program. The target is an addition—by 1953—of 1 million barrels to daily refining capacity. This would be up 14 percent over present levels.

Refinery production for this year is running 17 percent ahead of 1950 yields. Part of this boost is due to the effort the industry is making to compensate for the loss in supplies brought on by the turmoil in Iran.

So far the American petroleum industry has not been hurt by the loss of crude oil and refined products from Iran. In fact, the United States—aided by expanded output in the Caribbean countries and other Middle Eastern areas—has been able to boost production enough to keep most of the world from feeling the pinch of the shutdown in Iran.

As peak winter demand approaches, however, the industry here will show some signs of stress. The main problem is the lack of adequate pipeline capacity. The inability to transport oil may prove even more vexing than the job of increasing output.

Other Process Industries: The rubber shortage has been greatly eased by the reactivation of synthetic rubber plants with a capacity of more than 750,000 tons a year. Inventories of rubber-using manufacturers have bounced back to normal levels. The only real problem concerns butyl rubber. This item—the only synthetic suitable for use in tire tubes—is still a bit scarce and a boost in output is planned.

Textile production is adequate to meet combined military and civilian demand. Synthetic production has benefited from a phenomenal expansion in facilities. A large cotton crop bodes well for supply in that branch of the industry. And wool—which has had to contend with falling demand—is also expected to be in good supply.

The supply situation has eased for



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leather raw materials and end products. While some allocations and production limitation orders are still in effect, the increase in leather supplies has made possible greater use of materials.

Glass is performing a valuable service by replacing a variety of scarce metals. New uses are being found for glass in furnaces, chemical tanks and in building construction. Brass and copper tubing is giving way to glass. And small condensers are being built with glass instead of mica.

Key Bottlenecks: In the mobilization program as a whole, the great need is to increase the supply of metals. Steel, copper, aluminum, tungsten, molybdenum, nickel, lead and zinc are all allocated and are likely to remain under control for some while. Some metals like copper, tungsten and lead are likely to be short, partly because foreign producers can't boost output rapidly enough. Other metals, such as aluminum, will be in tight supply because the defense program brought skyrocketing demand.

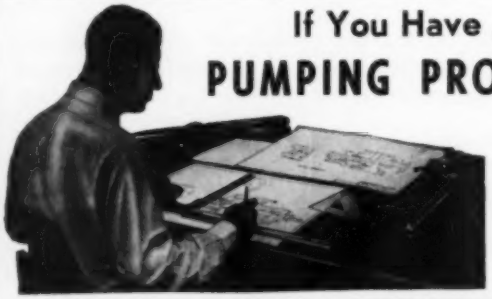
Steel is a notable case involving a rapid rise in output. Nearly $631 million of new plant is already in place. But there is a serious lack of balance within the expansion program. Steel works and rolling mill projects are about 35 percent completed, but only 19 percent of the more important blast furnace capacity is in place.

With these new facilities, steel production this year should be jacked up to an annual rate of 109 million tons. In mid-1950 the annual rate was 100 million tons. Additional facilities for coke production, coal-washing plants and railway and lake ore transportation will help boost steel output.

The manpower shortage can't be solved quickly. Engineers, designers and machinists can't be produced overnight. Industry can help by seeing that each person is working at his highest skill. Meanwhile the United States Employment Service is helping in the recruiting of trained workers.

Under the Wilson program, the flow of military end-items will double in another year. And the metals outlook will begin to improve. By 1953 the defense program will be far enough along so that cuts in production of automobiles and other consumer durables can be eased.

By 1953—barring a general war—the chemical industry also will have cleared most of its obstacles. It should be in a position to meet the combined needs of military, industrial and civilian users.



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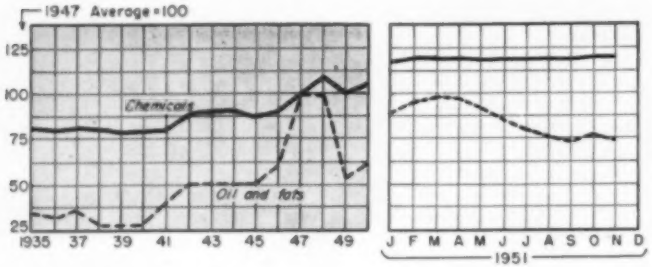
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*August, 1951 research study.

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Process Industry Trends

PRICES

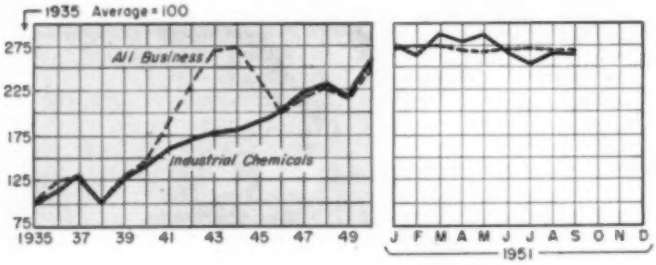


Chemical Engineering's Price Indexes

Chemicals – Up +0.4%
Fats & Oils – Down -1.4%

	Chemicals	Oils & Fats
As of Nov. 1	119.92	74.24
Last month	119.43	75.31
November 1950	114.68	78.73
November 1949	99.37	47.25

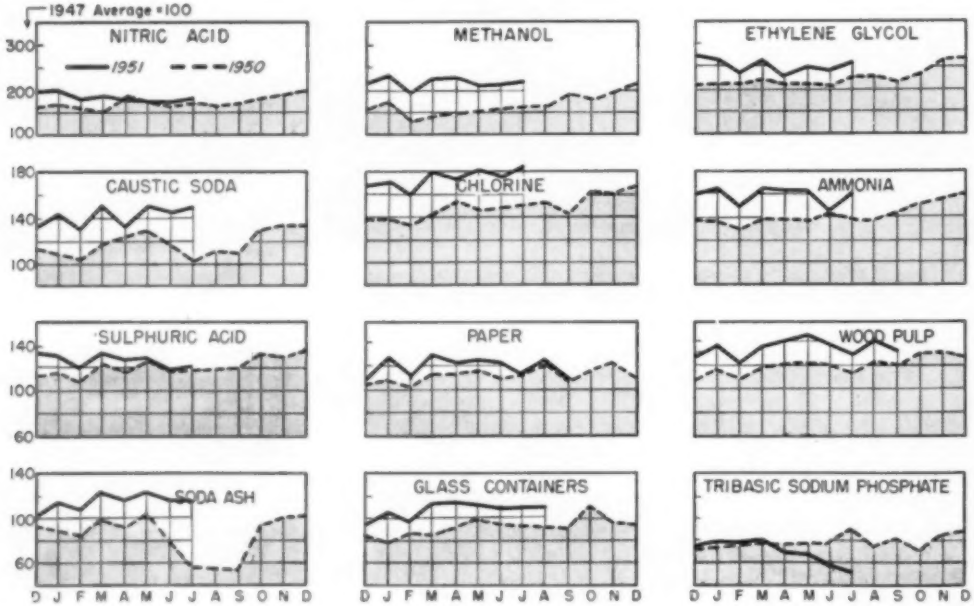
CONSUMPTION



Industrial Chemicals Index

	Sept. (Est.)	Aug. (Prelim.)	July (Revised)
INDEX	267.00	268.87	254.85
Fertilizers		50.09	49.08
Pulp and paper		30.46	27.60
Petroleum refining		26.41	26.15
Iron and steel		16.00	15.92
Rayon		33.27	32.90
Glass		23.99	22.19
Paint and varnish		28.21	25.88
Textiles		11.29	9.64
Coal products		11.46	11.04
Leather		3.77	3.30
Explosives		9.43	8.15
Rubber		6.33	5.81
Plastics		18.16	17.19

PRODUCTION



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Bearing sealed from dirt and other foreign material	YES	NO	YES
Enclosed bearing housing	NO	YES	YES
Bearing can be relubricated without being disassembled	NO	YES	YES
Motor can be regreased without removing drain plug	**	NO	YES
Automatic grease relief to suit any lubrication system	NO	NO	YES
Protection against grease entering windings	YES	*YES	YES
Balls free of direct pressure during lubrication	YES	NO	YES
Bearing can be removed without danger of distortion	NO	NO	YES
Reservoir to protect against undergreasing	NO	YES	YES
Standard commercial ball bearings	YES	YES	YES
Larger grease reserve than provided with any standard bearing	NO	YES	YES
Grease supply free of churning action	NO	NO	YES
Measuring unnecessary to prevent overgreasing	NO	*YES	YES
Unnecessary to grease equally at each side of ball race	NO	YES	YES
Lubricant is retained in ball race	YES	NO	YES

** Means is not provided for relubrication of assembled motor.
*YES, if drain plug is removed.

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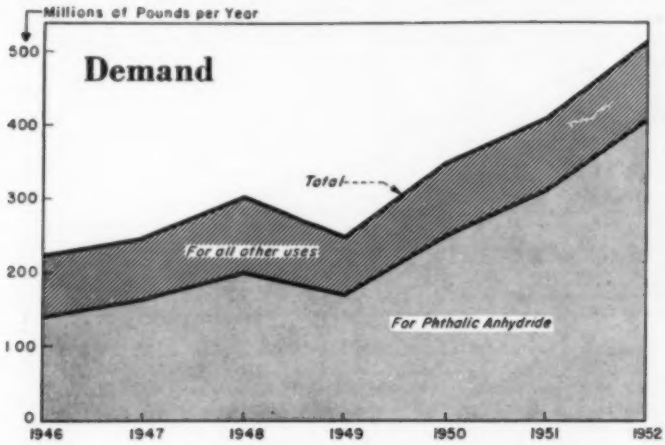
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Naphthalene: Now & Tomorrow

Demand for phthalic anhydride has caused a shortage in naphthalene—a shortage that'll get worse in 1952. Coal hydrogenation is the best long-range hope.

CHARLES T. BARKER, *chief, Coal Tar Unit, Chemical Division, National Production Authority, Washington, D. C.*

Naphthalene is now in short supply largely because of the rapid development of phthalic anhydride uses. This shortage will continue and probably will be worse early in 1952.

For the next few years, however, supply and demand will be reasonably well balanced by several factors: (1) additional recoveries from coal tar by processing of additional sources, (2) improved techniques, and (3) the use of naphthalene substitutes such as ortho-xylene.

There will be temporary and regional shortages. But major difficulties will not develop unless phthalic anhydride production capacity increases beyond the rates now anticipated.

For the long range, ample raw material for phthalic anhydride and other naphthalene uses should be available with the development of coal hydrogenation and substitutes for naphthalene, such as ortho-xylene.

Until 1950, the recovery of naphthalene kept up with the demand by installation of additional equipment and the processing of additional tar supplies. New and improved procedures increased the recovery from existing sources. We now approach a practical ceiling on these advances and it is time to make a critical survey of the supply and demand picture.

New Supplies: Continually increasing demands for naphthalene and other coal tar chemicals have induced many of the tar producers who formerly burned large quantities of their crude tar to recover an oil fraction from which naphthalene and other tar chemicals can be produced.

Additional crude tar has been sold to distillers for product recovery. As of January of this year, chemicals (including naphthalene) were being recovered from approximately 85 percent of the crude tar produced in the country. Nearly 75 percent of the crude tar produced is sold as such to distillers or refined in the producers' plants. In addition, over 15 percent of the crude is "topped" or partially distilled to recover a chemical oil cut. This contains naphthalene and other coal tar chemicals subsequently recovered, usually at a distiller's central refining plant.

These additional recoveries have been forced by (1) economic pressure created by the demand for naphthalene and allied tar chemicals and by (2) technological developments in tar residue combustion, proving that "topped tar" (the residue from the topping operation) is a satisfactory fuel in open hearth operations.

Additional tar supplies will undoubtedly yield to the same pressures in time. However, with present recovery methods it is expected that the demand will exceed the available supply from coal tar even when all practical sources are processed for recovery of naphthalene.

From the statistics in the table it is apparent that phthalic anhydride has become the major factor in naphthalene requirements. Projections through 1952 continue this trend. The development of the phthalic demand and the growth of alkyd resins, polyester resins and phthalic ester plasticizers have been discussed in numerous articles. It is sufficient to say here that these uses are expected to continue to demand increasing quantities of phthalic. It is necessary, therefore, to examine carefully the naphthalene supply situation.

More Accurate Figures: A procedure commonly used in estimating naphthalene supplies is to accept the data published yearly by the Tariff Commission. Naphthalene production is listed under "coal tar distillers" and also under "coke oven operators." A common error is to add these two productions and to report the total as "naphthalene available." This gives an inflated picture since a large part of the coke oven naphthalene is sold to distillers for upgrading before it is used by the chemical industry. This amount is therefore reported twice.

Furthermore, since there is some upgrading of crudes there is a duplication by the distillers themselves. In the data given in the table these duplications have been substantially eliminated through the use of private communications with industry; thus the totals remaining approach "true" availability.

The considerable increase in domestic production of naphthalene—indicating a recovery of nearly 100,000,000 lb. per year above the highest previous production—is due to several factors. It should be made clear that the potential supply of naphthalene in coal tar is in no sense unlimited although it is sufficient for immediate requirements.

CRUDE NAPHTHALENE – Where it comes from; where it goes

	Supply — In Millions of Pounds Per Year				Demand — In Millions of Pounds Per Year				
	Domestic Production[1]	Imports	Total Supply[2]	Total Demand	Phthalic Anhydride[5]	Beta-Naphthol	Other Dye Intermediates	Moth Prevention & Insecticides[6]	Miscellaneous Incl. Exports[7]
1946	205.7	Negl.	205.7	218.0	140.0	36.0	10.0	16.0	16.0
1947	254.6	2.1	256.7	249.0	170.0	34.0	12.0	16.0	17.2
1948	256.7	37.6	294.3	300.0	208.0	41.0	13.8	16.0	29.2
1949	226.0	49.6	275.6	251.9	173.0	31.9	9.5	16.0	21.5
1950	265.0	110.8	375.8	347.0	259.0	41.2	12.1	16.0	19.7
1951[3]	348.0	30.0[4]	378.0	411.2	316.0	43.5	14.3	16.0	21.4
1952[3]	396.0	30.0[4]	426.0	503.3	404.0	46.0	14.9	16.0	22.4

Supply data from Tariff Commission's "Synthetic Organic Chemicals," adjusted to eliminate duplication and captive use by means of private communications from industry sources. Demand data accumulated by private communication from industry sources and checked against published data of Tariff Commission and Bureau of Mines. Includes all grades of crude from 76-79 deg. Conversion between grades of crude eliminated. [1]Includes only those quantities going directly to end uses shown under "Demand." Conversion between grades of Crude eliminated. [2]Deficiencies in supply through 1950 taken up from inventories in producers' and consumers' plants. [3]Estimated; based on projected expansion programs or estimates for end product uses. [4]Original estimates made in April 1951; present expectations are that imports for 1951 may reach 40,000,000 lb; no change for 1951. [5]Does not include actual or potential production from ortho-xylene or other naphthalene substitutes. [6]Largely as moth repellents; insecticide use is minor. [7]Miscellaneous includes tanning assistants, wetting agents, chlorinated naphthalene, antioxidants (beta-naphthylamine).

Based on an estimated total annual coal tar production of 900,000,000 gal. and a recoverable naphthalene content of 5.0 percent by weight, the total available naphthalene is 450,000,000 lb. per year. Under present and near future conditions this recovery is not practical. At best, it is reduced to about 80 percent of this figure by two factors: (1) obsolete procedures that result in lowered yields, (2) incomplete availability of tar supplies for recovery.

Some crude coal tar is still being burned, principally as open hearth fuel. This now represents about 10 percent of the total supply. Technological advances in burning of topped tars have now reached the point where use of crude tar as a fuel can be substantially eliminated if demand forces it.

Advances in recovery methods, long available but only recently adopted, increase potential production from present sources. The major tar distillers, who are also the major naphthalene producers, are building new facilities that will use advanced techniques; to some extent they are revamping existing installations. To convert all existing facilities to the new procedures, because of the basic nature of the changes required, would necessitate a ten-year program that would cost in the neighborhood of $50,000,000. The net result would be to increase the potential naphthalene production to nearly 600,000,000 lb. per year. This long-range possibility will not seriously affect supplies for the next five years.

Changing Coke Oven Technique: The naphthalene supply in this country is also affected by the change that is taking place in coke oven operations. Gradually, over a period of years, coal tar yields and compositions have been changing. This has been brought about by changes in coal mixes charged to the ovens and by higher operating temperatures that result from shorter coking cycles. These factors tend to reduce the coal tar yield per ton of coal charged and to change its composition, particularly its naphthalene content. The tars produced are generally heavier and have markedly higher naphthalene content.

From these changes, although more coal is coked and more coke produced to make more steel, there is not a corresponding increase in tar output. Tar production has remained relatively steady and even decreased slightly some years. Naphthalene availability has increased. Within the past 15 years the tar recovery from a ton of coal coked has dropped from approximately 10 gal. to less than eight. Meanwhile the naphthalene recoverable from average tars by conventional methods has increased from about 3.5 percent to 5 percent by weight. These figures should not be confused with actual naphthalene content or recoverability by ultimate procedures.

Naphthalene Recovery: Recovery procedures in naphthalene production have varied considerably over the years. The demand up to the beginning of the World War II period—say about 1940—was never sufficiently high to cause serious efforts for complete recovery although research had developed improved procedures. Labor costs during most of this same period were low enough that the large amount of hand labor involved in the old pan and centrifuge procedure could be tolerated.

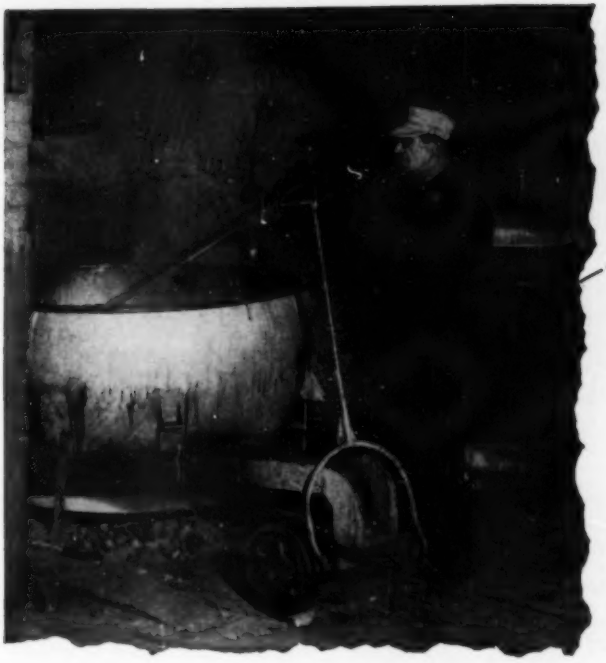
The original procedure, still in use in certain instances, was to take a cut of oil in the early part of the distillation of coal tar (called middle oil, naphthalene oil or chemical oil) that contained the bulk of the naphthalene originally present in the tar. This cut was taken without fractionation and might subsequently be redistilled again without fractionation. The resultant concentrated oil was allowed to cool and crystallize in shallow open pans to ambient temperatures. The fluid components were then drained off and the crystal cake broken up and centrifuged to produce a salable crude naphthalene. Certain refinements were added to the process from time to time.

A second redistillation; controlled temperature of cooling by insulation of the building surrounding the crystallizing pans; higher speed centrifuges; washing with water or soap solution during the centrifuge cycle—all these produced more uniform and higher melting point crudes.

Changing Technology: Increased demands for tar acids and tar bases occurring in essentially the same oil fraction as naphthalene resulted in several changes in technology. This has been particularly true in those locations where sufficient raw material was available to justify major expenditures for equipment.

Fractionating columns were installed on primary tar stills and particularly those operating continuously. Removal of tar acids and tar bases prior to naphthalene recovery reduced the solvent effect of these components. Continuous crystallization procedures were used. Direct recovery by efficient fractionation from acid and base free oils brought greatly increased yields. Finally, high vacuum procedures in both primary and secondary distillations produced ultimate yields approximating the actual naphthalene contents of the tars involved.

These developments required major investments and generally were limited



In 10 years

...not one cent for maintenance

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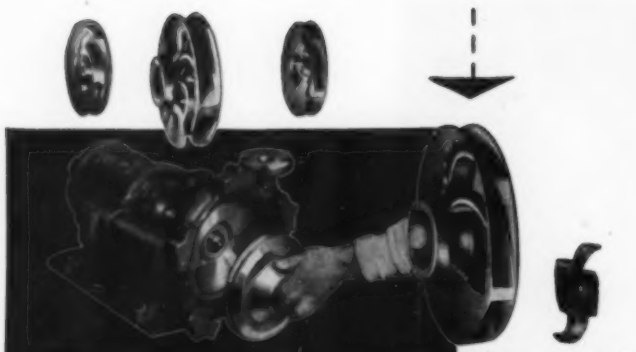
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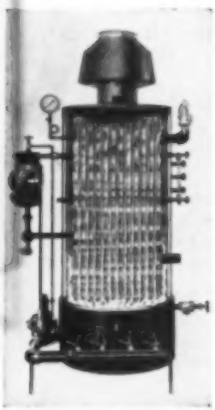
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to central refining plants having large volumes of tar available for processing. Yet a large part of the total tar processed is handled in smaller plants located close to individual sources of tar or a few such sources. This is economically necessary because of the marketing problems involved in disposal of the bulk products of tar distillation, the creosote oil, pitches and road materials. In most of these locations it is not practical to install the expensive fractionation and vacuum equipment essential to maximum naphthalene recoveries. Here, crude cuts are taken, sometimes redistilled to concentrate and reduce volume and then shipped to central recovery plants.

As the demand increases and the price is correspondingly strengthened, more and more fractionation and other equipment can be justified and will be installed. It is on the basis of projected developments along these lines that the estimates of available naphthalene for 1952 were established.

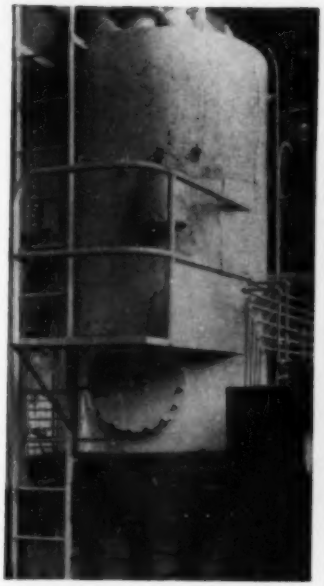
Foreign Sources: Imports of naphthalene have been a large factor in the supply picture and have in years past affected the development of naphthalene recovery processes and production in this country. As recently as 1939 imports of naphthalene represented nearly 30 percent of the total supply.

During the war years these imports were substantially discontinued since a large proportion of them came from Germany or German-controlled locations. In 1948 and 1949 substantial quantities came in again. The year 1950 was unusual in that an accumulation built up during and after the war was more or less dumped in this country. Now we can expect a leveling off to no more than the prewar level of about 50,000,000 lb. per year; less will be available during emergency periods.

Increases in phthalic anhydride production in Europe may well reduce imports of naphthalene to about 30,000,000 lb. per year or less. Even at the prewar rate of 50,000,000 lb. imports are no longer a major factor in supply since total requirements have now moved up to about 400,000,000 lb. per year.

Future Prospects: The apparent deficit developing in the naphthalene supply will increase if requirements continue to rise as predicted. Therefore, it becomes necessary to consider other sources of naphthalene or alternate raw materials for phthalic anhydride production.

Sources of raw material for phthalic anhydride (other than naphthalene from coal tars) have been developed and the long range prospect for ade-



Multi-tube catalytic reactor converts naphthalene to phthalic anhydride.

quate quantities is excellent. For the near future, ortho-xylene is perhaps the best possibility since the recovery of this material from petroleum sources is practical, particularly in view of developments in the use of the meta and para isomers for other purposes.

The expected shortage of naphthalene during the next two or three years will most likely be made up largely by production and the use of ortho-xylene. The necessary operating know-how has been developed in at least three companies now producing phthalic anhydride; production of 50,000,000 lb. per year of phthalic from this raw material could be started on short notice once the raw material is available.

Some work has also been done on the methyl naphthalenes that occur in recoverable quantities in coal tars.

Perhaps the most promising long-range solution lies in the coal hydrogenation development that seems likely to become a reality within the next five to ten years. A single coal hydrogenation plant with a rated capacity of 30,000 bbl. per day can produce more than 100,000,000 lb. per year of naphthalene.

Although present and immediate future supplies of naphthalene are inadequate for the accelerated demand we now experience, it is felt that the future supply is sufficient for anticipated needs.

—*End*

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New Construction

Proposed Work

Ill., Chester—Colchem Corporation c/o Eberstadt & Co., 39 Bway., New York, N. Y., plans to construct a coal hydrogenation plant on a 38,000 tract along the Mississippi River adjacent to Chester, to have a daily capacity of 15,000 to 30,000 bbl. of coal-made gasoline and byproducts such as benzene. Estimated cost between $100,000,000 and $400,000,000

Ill., Seneca—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., plans to rehabilitate former War Plant No. 2 here for production of nitric acid. Estimated cost $10,000,000

Kan., Lawrence—Cooperative Farm Chemicals Assn., subsidiary of Consumers Cooperative Assn., 320 10th St., Kansas City, Mo., plans to construct a nitrogen fertilizer plant here. Estimated cost $16,000,000

Ky., Paducah—B. F. Goodrich Chemical Co., 500 South Main St., Akron, O., plans to construct a chemical plant to produce vinyl chloride monomer. Estimated cost $5,000,000

La., Baton Rouge—Esso Standard Oil Co., North Baton Rouge, plans to expand refinery. Estimated cost $35,000,000

N. C., Charlotte—Lion Oil Co., El Dorado, Ark., plans to construct a anhydrous ammonia plant here. Estimated cost $30,000,000

O., Maple Grove—Basic Refractories, Inc., Hanna Bldg., Cleveland, O., plans to construct a plant here. MacDonald Engineering Co., 188 West Randolph St., Chicago, Cons. Engr. Estimated cost $4,000,000

Pa., Philadelphia—Gulf Oil Corp., 30th St. and Penrose Ave., plans to enlarge its refinery here. Estimated cost $10,000,000

Tenn., Charleston—Bowaters of Newfoundland Pulp & Paper Mill., Ltd., Corner Brook, Newfoundland, plans to construct a newsprint and unbleached sulphate mill here. Estimated cost $45,000,000

Tex., Corpus Christi—Sunray Oil Co., Phillower Bldg., Tulsa, Okla., plans to construct a new refinery. Estimated cost $10,000,000. C. H. Wright, First Natl. Bldg., Tulsa, owners staff engineer.

Contracts Awarded

Calif., Los Angeles—Crown Williamette Paper Corp., 2945 East 12th St., has awarded the contract for a factory and warehouse at East Los Angeles to Lindgren & Swinnerton, 605 West Olympic Blvd. Estimated cost $500,000

Calif., East Los Angeles—Naugatuck Chemical Div. of U. S. Rubber Co., Torrance, has awarded the contract for a 1 and 2 story factory addition to H. K. Ferguson, 411 West 5th St., Los Angeles, at $163,700

Calif., San Leandro—Crown Zellerbach Corp., 343 Sansome St., San Francisco, has awarded the contract for a paper converting plant here to Swinerton & Walbert Co., 225 Bush St., San Francisco. Estimated cost $3,000,000

Calif., Vernon—Union Carbide & Carbon Corp., 2305 East 52nd St., has awarded the contract for a 1 story warehouse and office to Buttress & McClellan, 1900 Beverly Blvd., Los Angeles, at $265,000

	Current Projects		Cumulative 1951	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	$1,790,000	$2,382,000	$12,446,000
Middle Atlantic	$10,000,000	2,950,000	34,950,000	72,788,000
South	115,000,000	53,600,000	291,490,000	377,629,000
Middle West	264,000,000	5,150,000	389,958,000	157,831,000
West of Mississippi	26,000,000	24,622,000	310,747,000	465,768,000
Far West	.....	3,929,000	38,581,000	68,941,000
Canada	.....	.....	190,877,000	159,883,000
Total	$415,000,000	$92,041,000	$1,264,885,000	$1,315,286,000

Fla., Fort Pierce—Naco Fertilizer Co., Ft. Pierce, will construct an addition to its plant. Work will be done by owner. Estimated cost $250,000

Ga., Rome—Rome Kraft Co. (Mead Corp., 118 West 1st St., Dayton, O., and Inland Container Corp., 700 West Morris St., Indianapolis, Ind.) has awarded the contract for a container board mill to Maxon Construction Co., Inc., 1733 Chapel St., Dayton, O. Estimated cost $25,000,000

Ga., Valdosta—National Container Corp., Borden Ave. and Review St., Long Island City, N. Y., has awarded the contract for a paper mill to Merritt-Chapman & Scott Corp., 17 Battery Pl., New York, N. Y. Estimated cost $21,200,000

Ill., Kankakee—Armour & Co., Union Stock Yards, Chicago, has awarded the contract for a pharmaceutical plant and laboratory to George A. Fuller Co., 111 West Washington St., Chicago. Estimated cost $3,000,000

Kan., Neodesha—Standard Oil Co of Indiana, 910 South Michigan Ave., Chicago, Ill., has awarded the contract for a catalytic cracking plant and alkylation unit at its refinery to Foster Wheeler Corp., 165 Bway., New York, N. Y. Estimated cost $7,000,000

Ky., Calvert City—B. F. Goodrich Chemical Corp. c/o Girdler Corp., contractor, 224 East Bway., Louisville, Ky., will construct a chemical plant here. Estimated cost will exceed $2,000,000

La., Baton Rouge—Naugatuck Chemical Co., Baton Rouge, has awarded the contract for an addition to its plant to Hall & Cox Construction Co., 5505 Adams Ave., Baton Rouge, at $149,746

La., Lafayette—United Gas Pipeline Co., c/o Brown & Boot, Inc., contractor, 4100 Clinton Dr., Houston, Tex., will construct a gas compression plant. Estimated cost will exceed $5,000,000

Me., Thomaston—Lawrence Portland Cement Co., 150 Bway., New York, N. Y., has awarded the contract for additions to its existing buildings and kiln to Saunders Engineering Co., 415 Congress St., Portland. Estimated cost $1,500,000

Md., Baltimore—Baltimore Paint & Color Works, 1505 Calverton Rd., will construct a 180x200 ft. storage building. Work will be done by separate contracts. Estimated cost $200,000

Mass., Acton—Rex Corp., 51 Lansdowne St., Cambridge, has awarded the contract for a factory for the manufacture of plastics to G. B. Macomber, 19 Milk St., Boston. Estimated cost $90,000

Mass., Cambridge—Godfrey L. Cabot, Inc., 77 Franklin St., Boston, has awarded the contract for altering and constructing laboratory addition to its carbon plant to Aberthaw Co., 80 Federal St., Boston. Estimated cost $200,000

Mont., Billings—Carpenter Paper Co., 815 Harney St., Omaha, Neb., has awarded the contract for an addition to its warehouse to Riedesel Construction Co., Billings. Estimated cost $100,000

N. J., Trenton—Columbia Carbon Co., 501 Cass St., has awarded the contract for a 4 story, 110x200 ft. factory to N. A. K. Bugbee Co., 54 Oakland St., Trenton. Estimated cost $600,000

O., Toledo—Ohio Plate Glass Co., 309 Morris St., has awarded the contract for a warehouse to George W. Lathrop & Sons, Inc., 1501 Montcalm St., Toledo. Estimated cost $150,000

Okla., Cushing—Deep Rock Oil Corp., Cushing, has awarded the contract for a package plant for motor oils and greases to Chemical Plants Div. of Blaw-Knox Construction Co., Cushing. Estimated cost $785,000

Okla., Oklahoma City—Mercury Oil Co., S. E. 69 and Santa Fe Sts., has awarded the contract for design and construction for enlarging its refinery to Refinery Engineering Co., Kennedy Bldg., Tulsa. Estimated cost $3,195,000

Pa., Curwensville—North American Refractories Co., National City East 6th Bldg., Cleveland, O., will construct a new tunnel kiln and dryer at its plant. Work will be done by owners with subcontracts. Estimated cost $2,000,000

Tex., Dallas—Williams & Wagner, Industrial Blvd., will construct a petroleum laboratory. Work will be done by owners. Estimated cost $96,500

Tex., Deer Park—Shell Chemical Corp., Shell Bldg., Houston, has awarded the contract for an elementary sulphur plant to Ralph M. Parsons Co., 617 South Olive St., Los Angeles, Calif. Estimated cost $1,600,000

Tex., Port Arthur—Gulf Oil Corp., Port Arthur, has awarded the contract for an ethylene plant to Lummus Co., M. Esperson Bldg., Houston. Estimated cost $10,000,000

Tex., Texas City — Texas City Chemicals, Inc., Texas City, has awarded the contract for a plant to Chemical Construction Co., 488 Madison Ave., New York, N. Y. Estimated cost $1,750,000

Va., Norfolk—Chilean Nitrate Sales Corp. c/o Tidewater Construction Corp., contractor, 538 Front St., Norfolk, will construct a fertilizer plant. Estimated cost $150,000.



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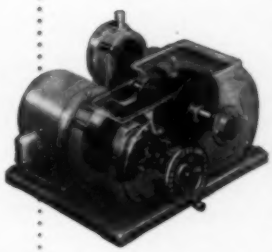
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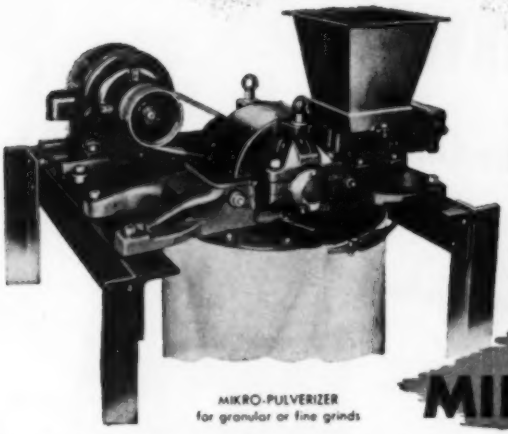

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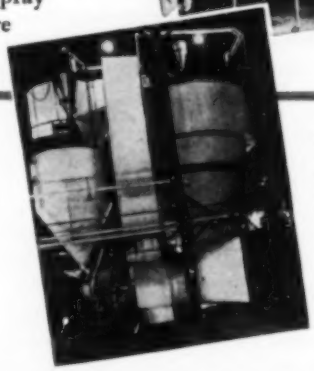
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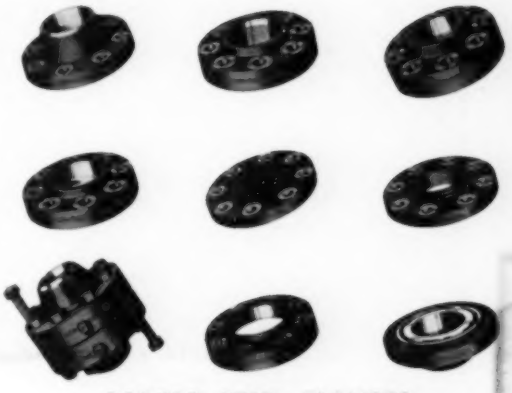
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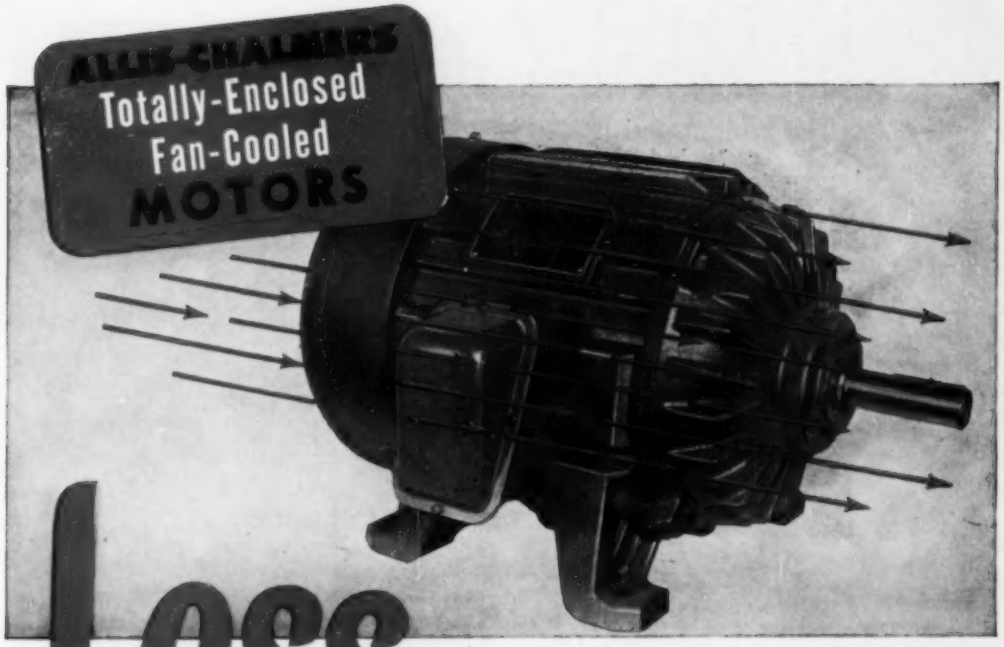
MOTORS — ½ to 25,000 hp and up. All types.



CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.



TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



Less MOTOR CLEANING ...INSPECTION...OVERHAUL!

HERE'S A MOTOR that actually blows itself clean! Dirt is carried away by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor.

Dirt can't build up to cause overheating. Concealed air passages and pockets have been eliminated. Even oily dirt that sticks can simply be wiped or blown off.

And this means savings! Maintenance costs are traditionally low on totally-enclosed, fan-cooled motors. But they're lower than ever before on the new Allis-Chalmers Type APZ tefc motor.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed, fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

A-3426

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CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.





PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

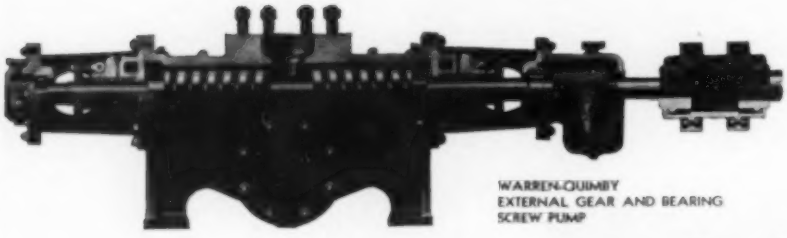
Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

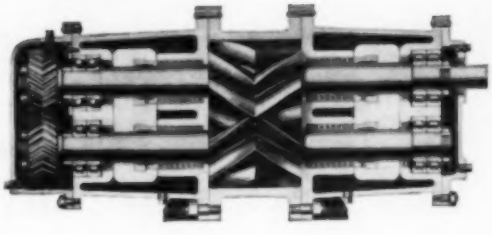
*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

QUIMBY doesn't Quibble

over a tough job . . . a Warren-Quimby Screw or Rotex Pump has what it takes to handle the toughest of pumping assignments in the Chemical Process field; and they accomplish it smoothly, quietly and with no pulsation.



WARREN-QUIMBY
EXTERNAL GEAR AND BEARING
SCREW PUMP



WARREN-QUIMBY ROTEX PUMP
WITH EXTERNAL GEARS

Have you a liquid handling problem involving any of the following materials?

Coal Tar Chemicals	Asphalt	Syrups and Molasses
Oils, Fats and Waxes	Fertilizers	Ceramics
Soap	Wood Products	Dyes
Petroleum Products	Brines	Paints and Varnishes
Drugs and Cosmetics	Cellulose Products	Glass
Paper and Pulp	Greases	Coal By-Products
Acetates	Distillates	Miscellaneous Chemicals

A Warren-Quimby Pump will do the job . . . and on a long-range basis, prove one of the most profitable equipment investments you ever made.



Both Screw and Rotex type pumps are available either horizontal or vertical mounted.

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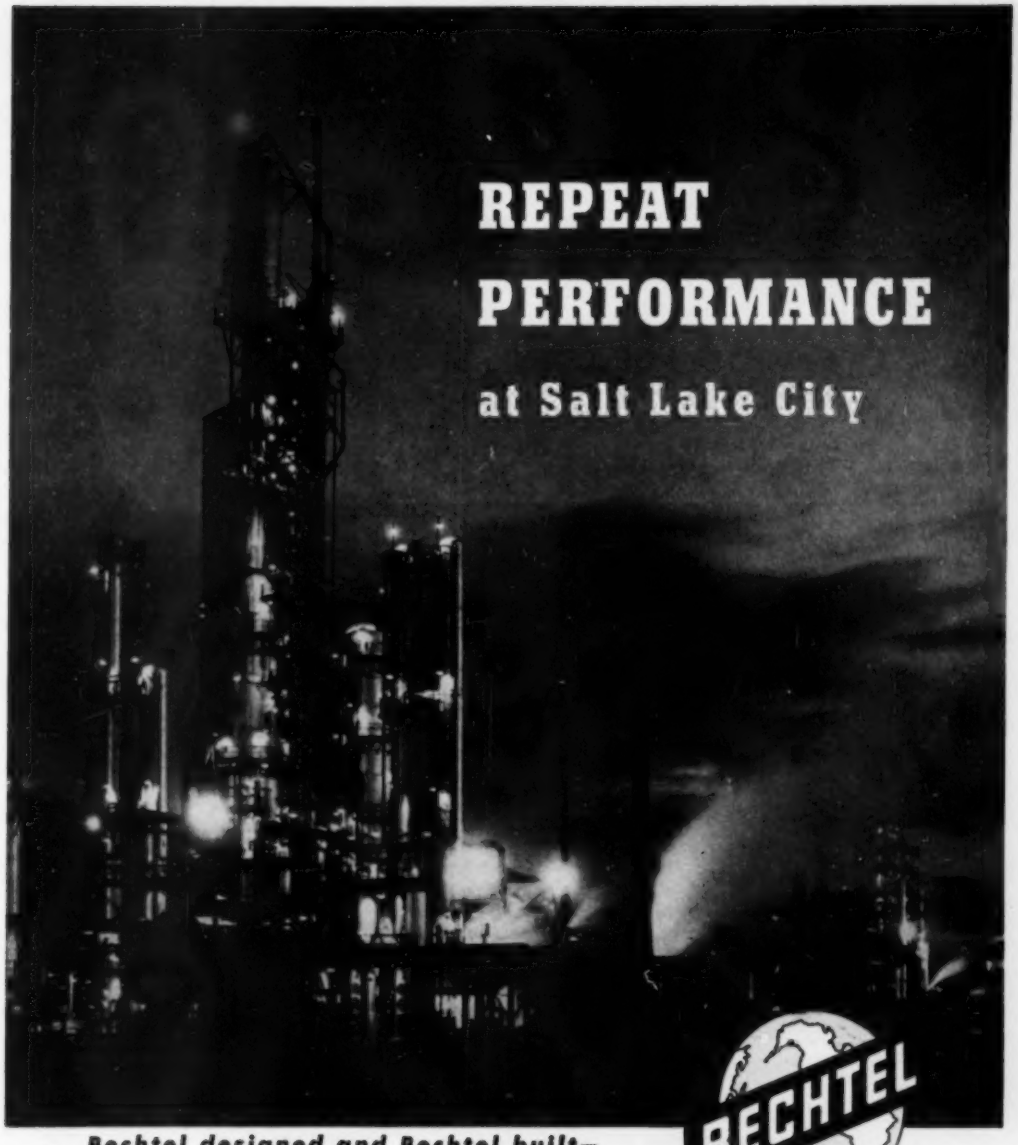
there's a Warren Pump for practically all pumping applications . . . and our complete line assures an unbiased recommendation.

WARREN QUIMBY PUMPS

CQ-1

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS



Bechtel designed and Bechtel built—

The expansion program recently completed for Salt Lake Refining Company, a subsidiary of Standard Oil Company of California, meets the needs of a growing market and the greater demand for high octane fuels. It was another "encore" for Bechtel Corporation at a refinery we originally engineered and constructed.

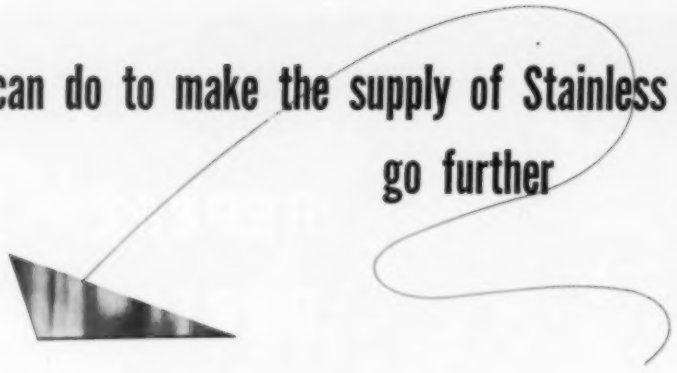
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"BUILDERS FOR INDUSTRY"

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What you can do to make the supply of Stainless Steel go further



Indicate acceptable alternates in composition and gage wherever possible

Keep these points in mind, too, when you order Stainless

Tell your supplier exactly where you'll use Stainless Steel and how you'll fabricate it.

Minimize scrap losses at the mill by ordering the exact sizes you will use.

Make full use of the steel you get by keeping down scrap losses in your shop.

● To speed up deliveries of the Stainless Steel you need, it's important that you give your supplier as much latitude in filling your order as possible. That means specifying alternates in composition, gage and even finish wherever you can.

Alternate compositions are especially important. By government order, certain alloys including nickel, molybdenum, columbium and titanium, have been restricted as to end use. But in many cases, you may be able to obtain an alternate grade that will fit your fabricating and service requirements.

Familiarize yourself with government orders regarding the use of Stainless Steel and examine your requirements in light of these directives. If you need assistance in evaluating various grades, gages etc., our representative will be glad to help.

LOOK AHEAD

When ordering, anticipate your needs as far in advance as possible and advise the rate at which steel will be required. And, above all, turn in every pound of scrap to the mills as quickly as possible. It is needed urgently to keep new steel flowing to you.

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USS

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SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

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UNITED STATES STEEL

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Metallic Ricinoleates
SHOW PROMISE OF
Stepped-Up Performance
IN MANY FIELDS

New Metallic Soaps

BARIUM RICINOLEATE
CADMIUM RICINOLEATE
CALCIUM RICINOLEATE
MAGNESIUM RICINOLEATE
ZINC RICINOLEATE

High potential usefulness in a wide range of applications is indicated for these new metallic soaps by current studies. They have shown parallel or better performance compared with metallic stearates and are highly recommended for any of the following:

- Adhesives
- Anti-corrosive agents
- Concrete
- Cosmetics
- Emulsions
- Greases
- Inks
- Lacquers
- Lubricants
- Oils
- Plastics
- Protective coatings
- Rubber
- Suspensions
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Barium ☐ Cadmium ☐ Zinc ☐
Calcium ☐ Magnesium ☐

Name_____
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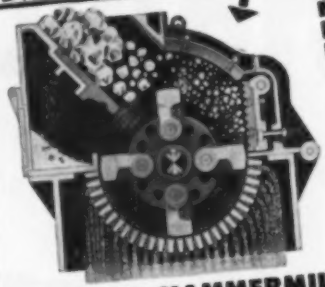
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GYPSUM . . . TOXAPHENE . . .

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2, 4-D . . . BHC . . . PYRETHRUM . . . SABADILLA

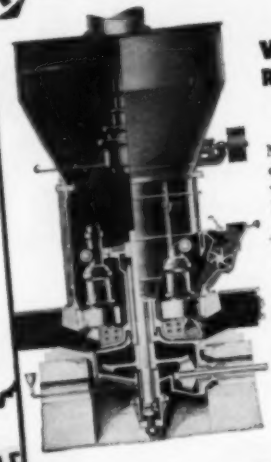
. . . ROTENONE



WILLIAMS HAMMERMILLS

Heavy duty for crushing and grinding rock phosphate, gypsum, limestone, shale, bauxite, asbestos rock and other chemical and fibrous materials to small sizes in one operation.

Many sizes to choose from and capacity is unusually high and power involved and maintenance extremely low.

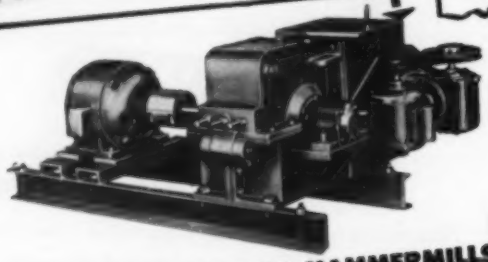


WILLIAMS ROLLER MILLS WITH AIR SEPARATION

Many materials are now economically pulverized with the Williams Roller Mill. Finenesses quickly changeable from 40 mesh to 400 mesh and materials may be dried and ground simultaneously.

Remarkable records are being made on insecticide mixes, pigments and dry colors and barytes, phosphate, limestone, etc.

WGR1-DC



WILLIAMS HELIX-SEAL HAMMERMILLS

Dustless fine grinding, 200 to 325 mesh, without the use of fans, cyclones or separators. Will also grind wet and sticky materials. Easy to install and inexpensive to operate. Variable speed control on feeder permits grinding of different kinds of materials.

PYRETHRUM

*W.T./M.G.P.**

"WILLIAMS TESTING...MEANS GUARANTEED PERFORMANCE

Submit your grinding problems to Williams. A sample of the material and description of the desired result will set our facilities to work on a solution to your problem. Visits during test runs and technical consultations are invited.

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Your corrosion problems are DURCO'S only specialty



Manufacturing equipment to resist industrial corrosives is our bread and butter. We have been doing nothing else for nearly forty years.

If you buy corrosion resisting pumps, valves, pipe or other related equipment, remember there are 1000 people and 400,000 square feet of floor space exclusively devoted to the production of this equipment, from casting through precision machining to finished product.

Call in your nearest DURCO representative to help you fill your requirements in just the right alloy or combination of alloys.

THE DURIRON COMPANY, INC.
Dayton, Ohio

Final machining operation on Durcopump rotating element.

The Series R Durcopump

Baker Platinum Laboratory Ware



Production of platinum laboratory ware has been a specialty of ours for almost three-quarters of a century, and we have devoted a great deal of research and experiment to improving it.

This work has been aided greatly by the fact that we maintain and operate large scientific laboratories and use our own platinum ware in them.

Thus, the ware is subjected to day in, day out tests through use, and practical experience has brought about a number of improvements, among which are:

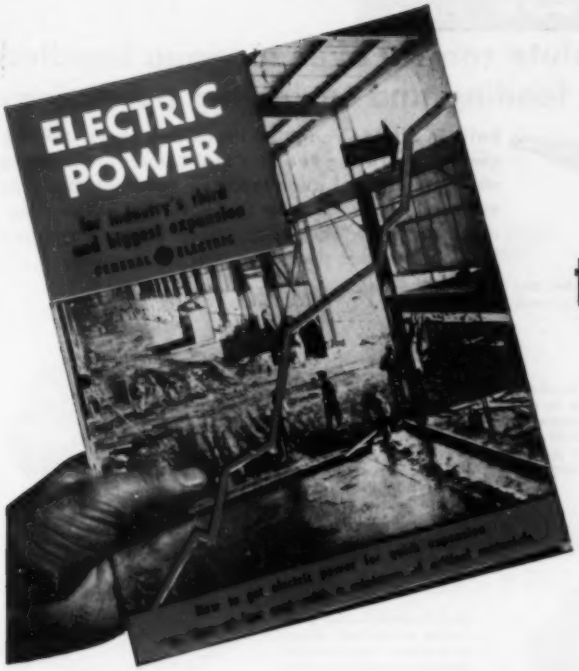
Improvements in metallurgical processes which have increased its useful life — development of the platinum-rhodium alloy which is now so widely used — design changes like the reinforced rim on crucibles and dishes — development of the low form crucible — improvements in the design of platinum electrodes.

You run no risk in making Baker Platinum Laboratory Ware standard equipment.

BAKER & CO., INC.

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NEW YORK **SAN FRANCISCO** **CHICAGO**



Here's your guide to quick economical power expansion

Tells how to:

- Get more power for expanding production.
- Modernize old electric systems easily and economically.
- Save months in getting urgently needed electrical equipment.
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- Conserve vital materials and manpower.
- Simplify planning, purchasing and engineering problems.
- Plan economically to provide for future growth.
- Guard against power shut-downs and lost production.
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Just off the press — a new booklet that tells how to plan your plant electrical system to meet today's need for more production — at low cost!

If you're planning for plant expansion—if you want more electric power to keep machines operating at top capacity—if you recognize the need for a more modern, more dependable electric power system—here's a booklet that may mean thousands of dollars to you in over-all equipment savings and lowered production costs.

It tells how hundreds of plants today are expanding and modernizing their electrical systems with the latest developments in G-E standardized "packaged" power distribution equipment.

It shows how you can cut corners in getting the equipment you need in the quickest time and with the least trouble. It demonstrates how you can often save through reduction of power losses—how you can plan effectively to meet future needs for years ahead.

This booklet is profusely illustrated with photographs of actual installations—some of them probably applicable to your plant. Send now for your copy—General Electric Company, Schenectady 5, N. Y.

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GENERAL ELECTRIC

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and all provide absolute control over tonnage handled in feeding and conveying operations



Small Reagent Feeders—with open or enclosed decks for capacities from 10 to 4000 lbs. per hour.



Spreading Feeders—for distributing materials evenly across wide surfaces.

Built in a wide range of types and sizes, Jeffrey electric vibrating Feeders and Conveyors provide absolute control over tonnage handled. Open or enclosed pan, or tubular decks, for capacities ranging from a few pounds to fifteen hundred tons per hour. Investigate the accuracy of this equipment.



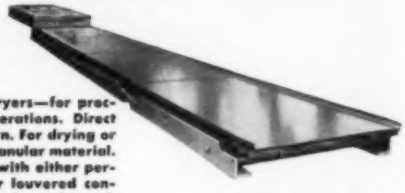
Spark-Proof Feeders (left)—for use in explosive atmospheres or where moisture conditions require special protection of coils.



Conveyors—electric vibrating type. 18" diameter tubular conveyor powered by dust-tight power units for use in iron ore sintering plant.



Dust-Tight Feeders (right)—vibrating motor gaps protected from magnetic dust, or explosive dust.



Coolers-Dryers—for processing operations. Direct type shown. For drying or cooling granular material. Equipped with either perforated or louvered conveying surface through which air or gasses are passed.



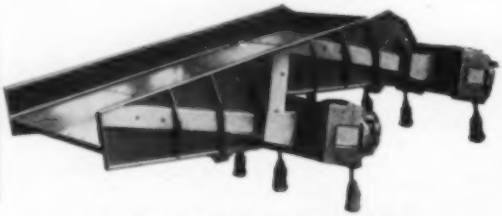
Water-Jacketed Feeders (left)—for feeding furnaces and driers, or handling hot material to coolers, etc.



Bin Level Indicator (above)—shows bin level at a glance to control feed to bin, maintain bin level or control discharging equipment.



Low Head type Barrel Packer (above)—a real economy in reducing size of containers, increasing capacity and cutting shipping costs. Can be supplied with deck to provide conveying action during packing operations.



Large Capacity HEAVY DUTY Pan Feeders

Also electric vibrating Screens, Bin Check Valves, Electronic Controls, Magnetic Separators and Mechanical Vibrating Conveyors. Let us tell you more about these units and what they can do for you. Write us today.

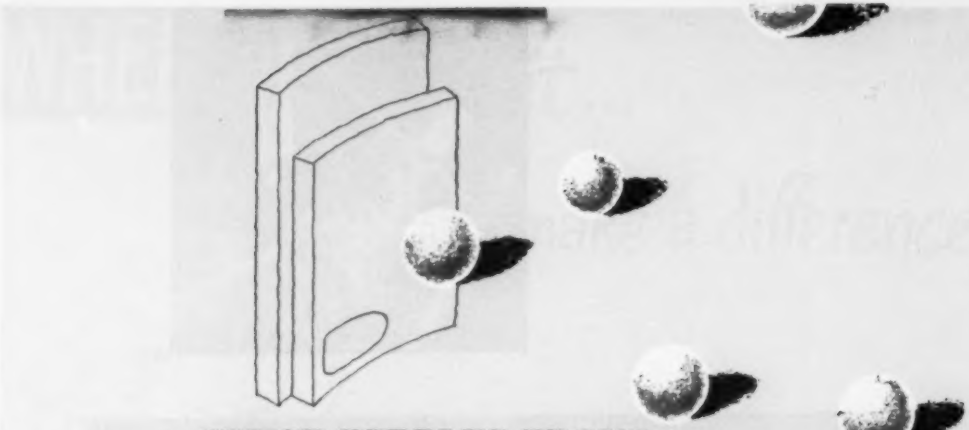
THE JEFFREY MANUFACTURING COMPANY Established 1877

909 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

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Beckley, W. Va. Buffalo 2 Cleveland 15 Forty Fort, Pa. Jacksonville 2 Philadelphia 3 Salt Lake City 1
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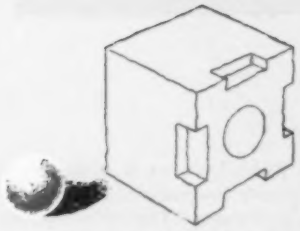
Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain Ltd.), Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio



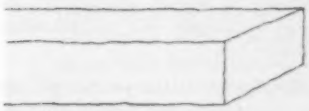
THESE PEBBLES PROVE:

IN REFRACTORIES

ALCOA ALUMINA CAN TAKE IT



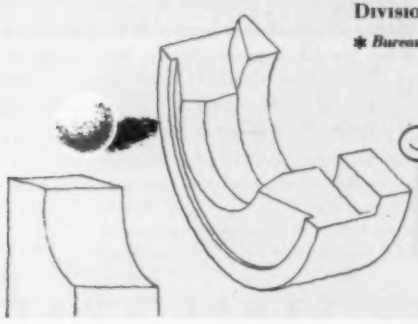
In a recent 7-month test conducted by the Bureau of Mines*, ALCOA Alumina proved it can stand up under grueling treatment. During this period, ALCOA Tabular Alumina pebbles passed through a commercial-size pebble heat exchanger. During each cycle they were alternately heated to above 2000° F. and cooled to 300°-450° F. Yet under these extreme operating conditions, the ALCOA pebbles gave excellent service and considerably out-performed other pebbles tested. They showed unusually low breakage from heat and mechanical shock as well as outstanding resistance to abrasion. These same excellent results are being attained with ALCOA Alumina pebbles in other commercial pebble heat exchangers.



Aluminum oxides in various forms are widely and successfully used for super-duty refractories . . . special cements . . . grinding balls . . . spark-plug insulators . . . and a variety of ceramic bodies. If severe operating conditions are causing you refractory problems, perhaps you can benefit from the exceptional performance record of ALCOA Aluminas. Let us show you how they can profitably apply to *your* business.

Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 602L Gulf Building, Pittsburgh 19, Pennsylvania.

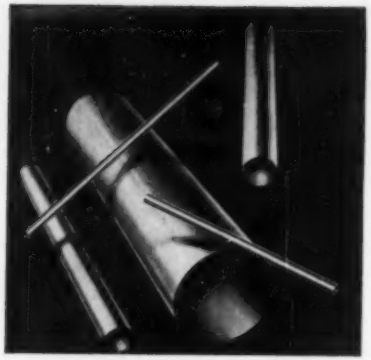
* *Bureau of Mines, Report of Investigations 4781*

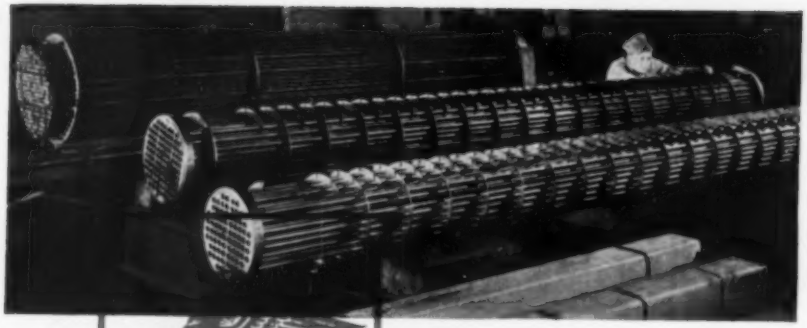


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ALCOA **ALUMINAS and FLUORIDES**

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A. O. SMITH designs with TRENTWELD

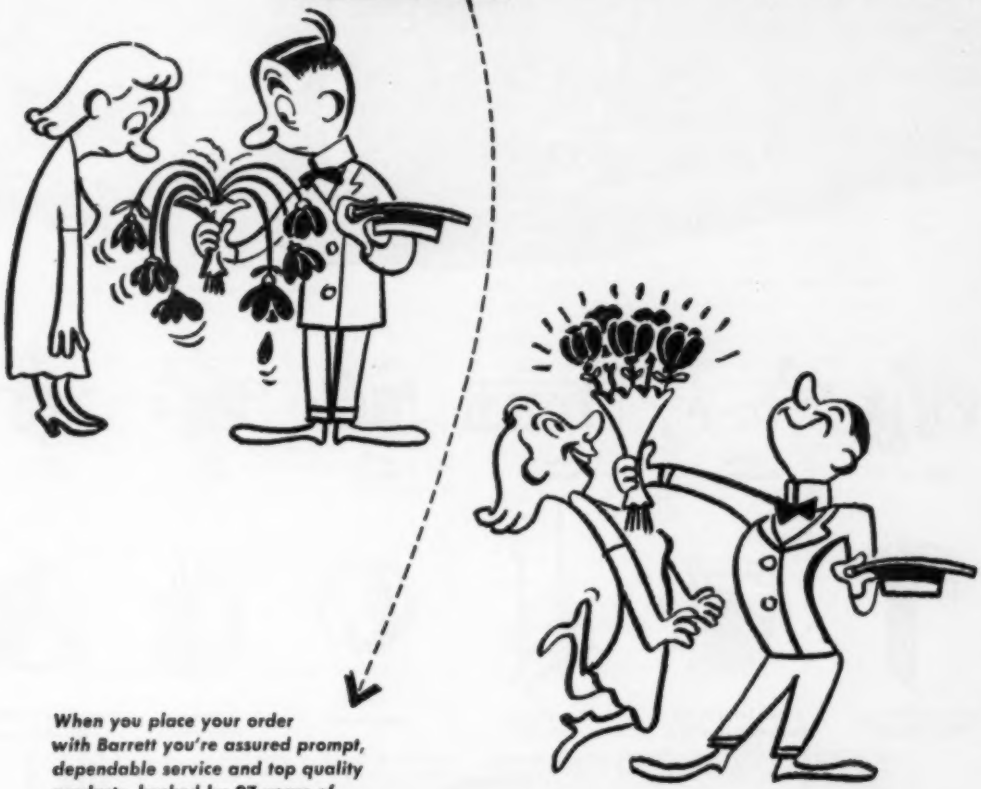
When A. O. Smith, big name in steam and heat transfer equipment recently designed and built a heat exchanger unit for Socony-Vacuum — TRENTWELD Stainless Steel tubing was used throughout. This heat exchanger unit for use in the petroleum industry is another example of how TRENTWELD is preferred by designers for products where stainless steel tubing fits the bill.

And here's why: TRENTWELD is the product of tube specialists. That means you're assured uniform quality and specifications of manufacture that meet your most exacting needs. Then too, TRENTWELD is available in a full range of sizes—⅛" to 36" in diameter, in all grades and finishes. When the job requires stainless steel tubing, check with us. TRENT TUBE COMPANY, *Subsidiary of Crucible Steel Company of America*. General offices and plant — East Troy, Wisconsin; Sales offices in principal cities.

TRENTWELD

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WHERE you get it... DOES make a difference



When you place your order with Barrett you're assured prompt, dependable service and top quality products, backed by 97 years of successful manufacturing experience.

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Phenols
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CUMAR* Paracoumarone-Indene Resin
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Flotation Agents

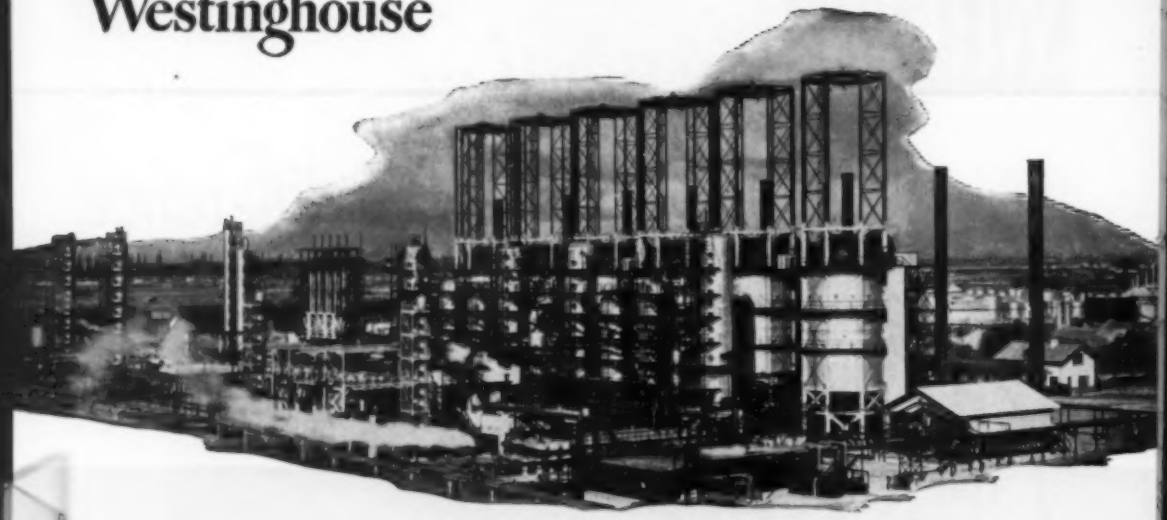
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Oil Immersed Pushbuttons



Oil Immersed Panelboards



Westinghouse

Unit Responsibility

CUTS CHEMICAL POWER COSTS

The manufacturer of your steam and electrical equipment plays a vital role in providing the most efficient power system for your chemical processes. In serving you, that manufacturer should be capable of:

1. Providing the complete line of power equipment your process may require.
2. Furnishing you co-ordinated engineering and supervision of installation.
3. Giving you the benefit of years of experience in the application of power equipment in the Chemical Industry.

These elements of unit responsibility add up to a reduction in costs. You get them all from Westinghouse.

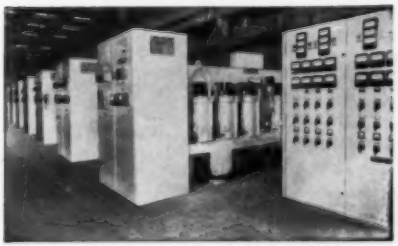
Generation: Westinghouse gives you the complete installation for producing power, plus help in working out your electrical and steam requirements for the most efficient possible plant balance.

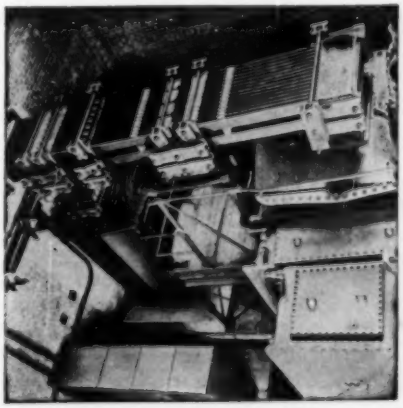
Distribution: Westinghouse makes a correlated line of distribution apparatus, ranging from the smallest arrester to the world's largest substation. All indoor and outdoor enclosures are Bonderized to resist corrosion, and outdoor switchgear is additionally protected by all-weather undersurface coating.

Utilization: Westinghouse makes a full line of mechanical drive turbines and chemical motors, ranging from small, explosion-proof, fan-cooled, Life-Line motors to the largest explosion-resisting, inert-gas-filled, squirrel-cage type motors ever built. A complete line of Westinghouse control, including corrosion-proof or explosion-proof types where needed, is also available to meet the rigid requirements of chemical plant service.

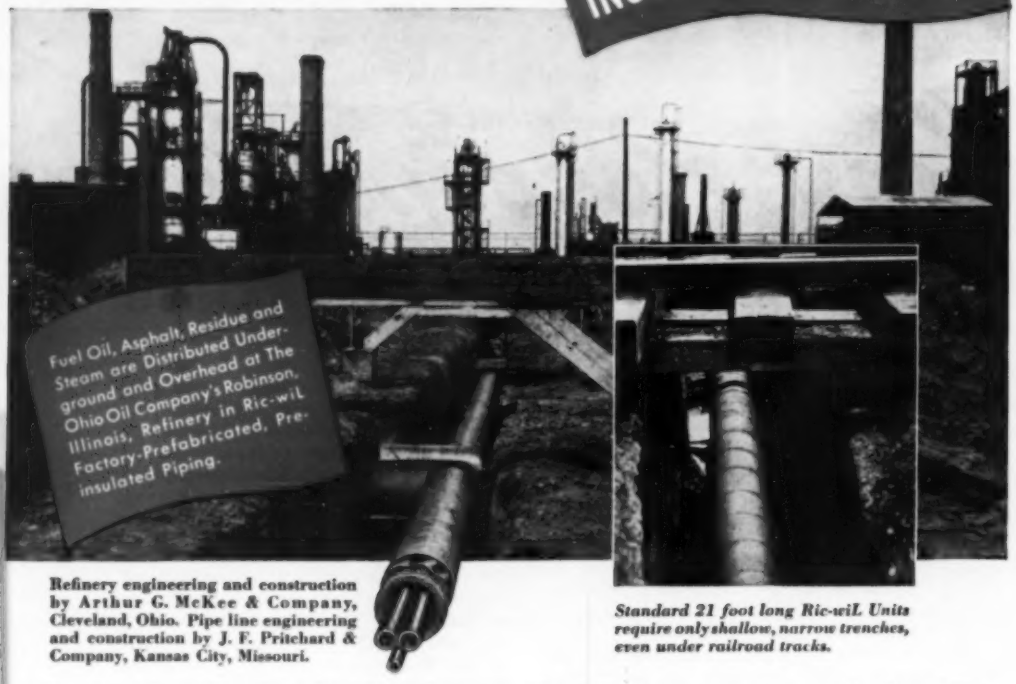
Give us an opportunity to assume this unit responsibility and help you find the solution to your chemical power problems. Call your nearest Westinghouse office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94804

(Below) Westinghouse Ignitron Rectifiers provide large blocks of rectified power. They carry heavy loads continuously, at full capacity, with safety and at low maintenance cost. ***(Right)*** Without this 40,000-ampere-series resonance furnace circuit, developed by Westinghouse, the power factor would have been 30%. In this chemical plant installation, use of the series transformer reduced installation cost and raised power factor to unity.





Oil Refinery Meets Diversified Piping Needs with RIC-WIL INSULATED PIPE UNITS



Refinery engineering and construction by Arthur G. McKee & Company, Cleveland, Ohio. Pipe line engineering and construction by J. F. Pritchard & Company, Kansas City, Missouri.

Standard 21 foot long Ric-wiL Units require only shallow, narrow trenches, even under railroad tracks.

● The adaptability of Ric-wiL Insulated Piping Systems to any type of piping requirement is ably demonstrated by this refinery installation. It consists of ten separate runs of prefabricated pipe units employing a wide variety of pipe sizes and pipe arrangements for distribution of steam and viscous fluids at various temperatures.

The temperatures required for the distribution of the various viscous fluids are efficiently maintained in Ric-wiL Uniline Insulated Pipe Units. In this type of construction, pipes carrying oil, asphalt, etc., are nested with a steam tracer inside an insulation liner which insulates them from the exterior but not from each other.

At Ohio Oil, many different viscous fluids are carried in 4″ and 6″ pipes at temperatures ranging from 125° to 400°F. Steam for tracer lines and processing is distributed in pipes of from 1″ to 6″ diameter at 150 psi, 450°F.

Pipes and insulation are housed in helically corrugated, 16 gauge galvanized ingot iron Hel-coR conduit, ranging from 8″ to 21″ in diameter. The inherent flexibility and strength of this conduit permits underground installation with only 3′-5′ cover, even under heaviest ground loads. Overhead installations require a minimum of scaffolding and supporting structures. Units may be connected on ground before being lowered into trench or erected for overhead suspension. Entire piping systems are delivered completely prefabricated with all accessories—elbows, tees, anchors, expansion loops, etc.—ready for speedy, low cost installation.

Ric-wiL manufactures three basic types of Prefabricated Insulated Piping Systems—Hel-coR, Foilclad and Cast Iron Pipe Units. Pipe, insulation, and protective covering are factory-tailored to individual specifications to meet any condition or requirement for outside piping distribution. For descriptive literature, full information, write: The Ric-wiL Company, Department 1-D.



First Again

Bethlehem, which developed for the oil industry the *first* integrated submersible drilling barge and the *first* submersible compressor barge, now introduces the *first* submersible oil tank battery barge.



Constructed by Bethlehem's Beaumont Yard, this submersible tank battery barge can store 4,800 bbls of crude in its 72 ft x 48 ft x 8 ft superstructure. Part of the 80 ft x 52 ft x 5 ft float is submerged in this view.

NOW...Bethlehem's Submersible Oil Tank Battery Barge

For the Most Economical and Efficient Interim Storage of Crude in Shallow Water or Marshland

- Storage Capacity to Suit Your Requirements.
- Complete with Pumps, Oil and Gas Separators and Compressors.
- Eliminates Need for Costly Erection Crews Miles from their Base.
- No Piling to Pull or Cut when Moved.
- Mobility, if and when Necessary . . . with 100 per cent Salvage.
- Leakproof . . . Solves Pollution Problem.

Our engineers will be happy to supply further details on request.

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General Offices: 25 Broadway, New York 4, N. Y.

On the Pacific Coast shipbuilding and ship repairing are performed by the Shipbuilding Division of Bethlehem Pacific Coast Steel Corporation

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THIS DEPENDABLE McLANAHAN EQUIPMENT

FOR ECONOMICAL PIT, MINE and QUARRY OPERATIONS

For more than a century, McLanahan equipment has served pits, mines and quarries of America and foreign countries . . . for crushing, washing, sizing and conveying all types of ore, coal and rock. The equipment illustrated shows the wide variety of products we build. Additional data gladly sent upon request.



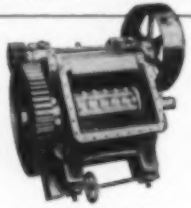
All Steel Rockmaster Single Roll Crusher for primary or secondary work on rock and ore.



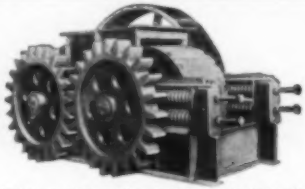
Special Heavy Duty Reciprocating Feeder—Handles any material from sand sizes to shovel loaded rock and ore.



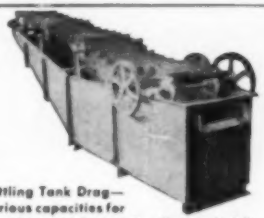
Steel Paddle Mill Scrubber—high capacity for cleaning large size feed.



Automatic Steelstrut Crusher for primary and secondary work in small plants.



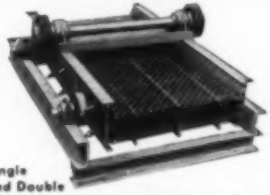
Fabricated Black Diamond Double Roll Crusher for secondary reduction.



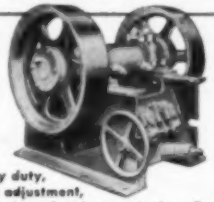
Settling Tank Drag—various capacities for cleaning and dewatering fine materials.



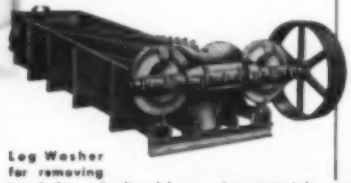
Heavy Duty live roll Grizzley for sizing and feeding various products.



Single and Double Deck Vibrating Screens in different sizes.



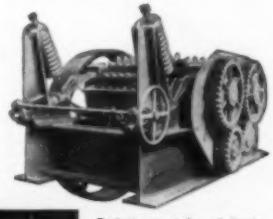
Heavy duty, quick adjustment, all steel overhead eccentric Jaw Crusher, for primary and secondary work in small plants.



Log Washer for removing tough clay and soft rock from various materials.



Double duty combination Scrubber and Sizing Screen for large and small capacities.



Fabricated Steel Swing cage Double Roll Crusher—Quick Adjustment—without change of gears. Tramp Iron Protection.

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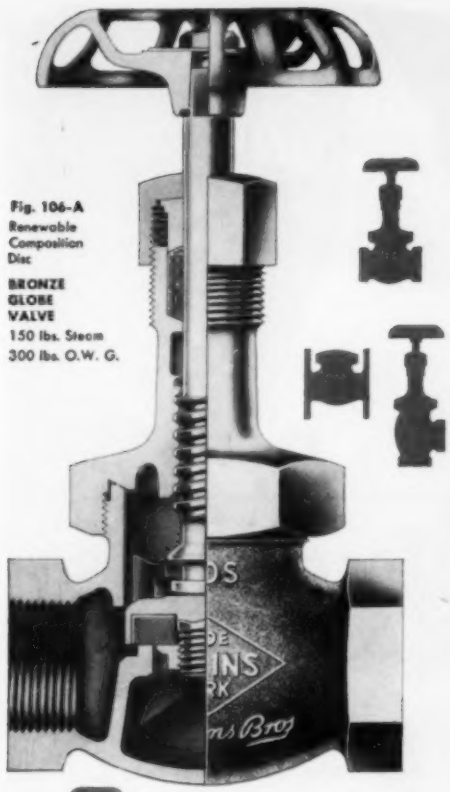


Fig. 106-A
Renewable
Composition
Disc

**BRONZE
GLOBE
VALVE**
150 lbs. Steam
300 lbs. O.W. G.



JENKINS
VALVES

All these Valves . . from One!

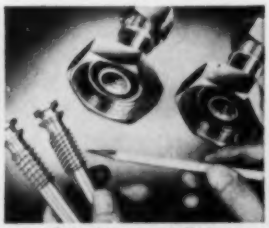
Valve combinations for 90% of industrial piping assembled with 4 bodies and a handful of parts.

JENKINS FIG. 106-A "FAMILY"
Start with the standard Fig. 106-A. Trimming is interchangeable in Globe or Angle body, screwed or flanged.

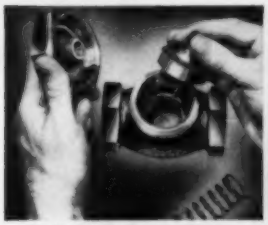




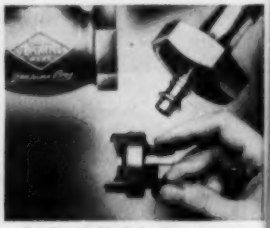
For Close Control — In throttling service, the nut which holds the disc in the disc holder is removed and replaced with Throttling Nut, Fig. 344.



For Quick Opening and Closing — Merely substitute the bonnet and spindle from Fig. 941, in which threads are pitched more sharply.



For Lift Check Service — Globe or Angle Bodies can be fitted with interchangeable Cap, Disc Holder, and Guide Disc Nut from Fig. 117A. Addition of spring from Fig. 655A provides spring loaded service.



For Stop & Check Service — Use the 106A trim, but substitute this spindle from Fig. 630A and replace the regular disc nut with the check valve guide disc nut.

Look over these pictures and see how easy it is to make up just the valve type you need, simply by interchanging parts. Think of the saving this means in maintenance expense . . . in reduced inventory of spare valves in your stockroom.

That's a big reason why the Fig. 106-A series takes top honors in any poll for valve preference. And Jenkins time-proved design, makes them the longest-lasting, lowest-upkeep valves that money can buy.

For example, see the heavy construction of the one-piece, screw-over bonnet. You can remove and replace it over and over again without distortion. See the extra size packing box,—and the perfectly machined threads on the heavy manganese bronze spindle, with more threads in contact with the bonnet, open or closed.

Remember, Jenkins Bros. is the originator of the renewable composition disc valve,—the *only* manufacturer of both valves *and* discs. For drop-tight, trouble-free performance, get acquainted with the Fig. 106-A "family". Despite their extra value, *you pay no more* for Jenkins Valves. Jenkins Bros., 100 Park Ave., New York 17, N. Y. Jenkins Bros., Ltd., Montreal. Sold through leading Industrial Distributors.

THE SPEED REDUCER THAT SAVES YOU MONEY!



Dodge

Torque-Arm

America's Most Complete Line of Shaft-Mounted Speed Reducers

- No special engineering required. No foundation to provide. No flexible couplings. No sliding base. No "lining-up" difficulties. No expensive installation. Stock TAPER-LOCK sheaves prescribed for each job to provide desired speeds. Application to other machines is practical and easy.
- Unit is driven through any V-Belt Drive. Torque-arm, fastened to any fixed object, anchors the reducer unit. Turnbuckle provides fast and accurate adjustment of belt tension.
- Backstop available from stock when required. Simple. Positive. Easily installed. Sealed inside the reducer housing.
- Compact, light weight, *rugged*. Quality built by Dodge for Dodge *dependable* service.
- Built in two series—Single and Double Reduction. Capacities from 1 to 27 h. p. Speeds from 12 to 330 rpm. Available from distributors' stocks.
- WRITE for special bulletin A602.

DODGE MANUFACTURING CORPORATION, 200 Union Street, Mishawaka, Indiana

DODGE
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CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in classified phone book.



FIRST IN POWER TRANSMISSION MACHINERY!



V-BELTS AND TAPER-LOCK SHEAVES



DODGE-TIMKEN PILLOW BLOCKS

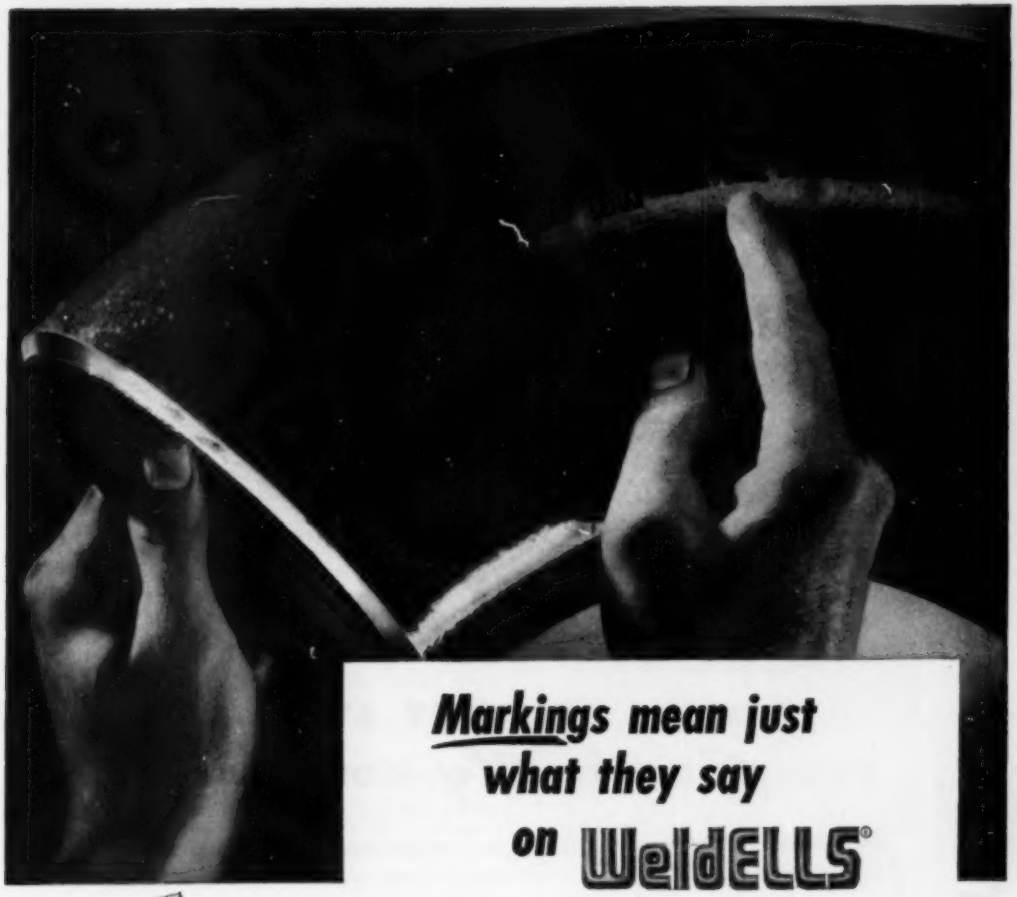


ROLLING GRIP AND DIAMOND D CLUTCHES



SOLID STEEL CONVEYOR PULLEYS

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1535 SHEFFIELD AVENUE, CHICAGO, ILLINOIS



Markings mean just what they say on WeldELLS®



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No other fittings for pipe welding are so true to their markings as WeldELLS — so absolutely uniform, mechanically, metallurgically, dimensionally.

It would be bad business for us to say this if thousands of users had not already said it for us and to us. "There are no bad ones" is nearly always the foremost reason given by practical men for insisting on WeldELLS.

Pick up any WeldELL and check it against the tabulation of its size, wall thickness, and other dimensions. It will be right on the head. And it will be right on the head in plus-value features, too—features that are combined in no other fittings.

Remember that the finest line of welding fittings is also the broadest line. Coupon brings your copy of useful data described below.

TF

Please send a copy of your data sheet covering Taylor Forge Welding Fittings and Forged Steel Flanges.

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COMPANY_____

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513-11551 Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

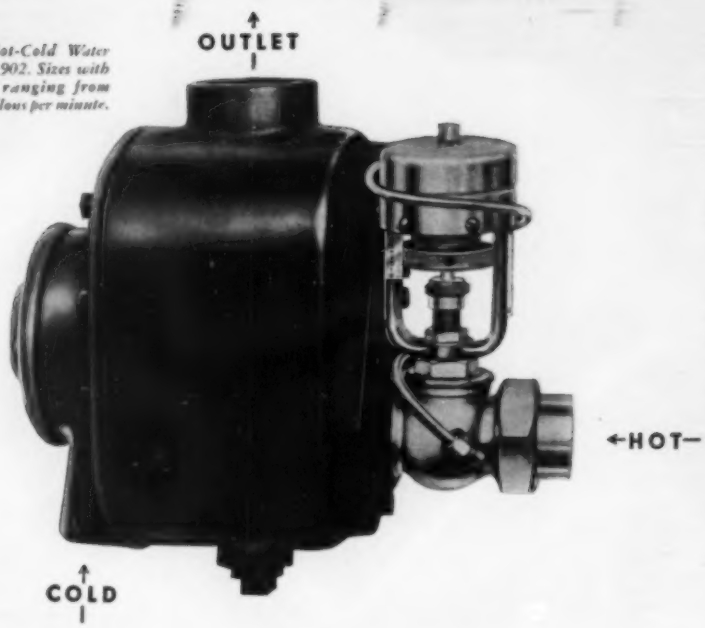
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SYLPHON CONTROLS FOR DEPENDABILITY

Sylphon Hot-Cold Water Mixer No. 902. Sizes with capacities ranging from 5 to 131 gallons per minute.



SPECIAL DELIVERY SYSTEM FOR *Constantly* HOT WATER!

Used in
Factories
Office Buildings
Apartment Houses
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Schools
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for
Gang showers
Needle showers
Continuous baths
Wash fountains
Process water for packing houses, bakeries, dairies, garages, other industries

If you require constant temperature hot water for processing, showers and other operations—see what this thrifty, easily-installed Sylphon Hot-Cold Water Mixer can do to help you.

It uses hot water from any storage tank or instantaneous heater. It regulates the amount of cold water required to temper it to the desired degree. Water is actually mixed together before delivery. Temperature remains constant—even if supply water temperature or pressure fluctuates. Everything works automatically—dependably!

Here's an extra advantage. If either hot or cold water supply fails, the Sylphon Mixer immediately shuts off the remaining supply. When supply is returned, the Mixer starts operating again.

Sylphon Hot-Cold Water Mixers are self-contained, self-powered, ruggedly built. Adjustable temperature range. For complete information, write Department VC.

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON DIVISION

FIRST WITH BELLOWS

ROBERTSHAW FULTON CONTROLS CO. KNOXVILLE 4, TENN

Canadian Representatives, Darling Brothers, Montreal



for maximum furnace life

THERE is no *one* bonding mortar that is best for all conditions. Harbison-Walker manufactures more than a score of different classes and types, each of which has definite fields of applications. From this complete line, there can be selected the brand that will insure greatest economy, minimum maintenance and maximum furnace life for any service.

Harbison-Walker mortar materials comprise

Air-Setting cements for making brick joints which remain strong over the temperature range of their utility.

Hot-Setting mortars to provide a bond which is firm and impermeable at high temperatures, and also flexible to permit relief of stresses caused by expansion.

Developed through research, these mortars have the optimum combinations of properties such as workability, water retention, thermal expansion, strength, refractoriness, impermeability and resistance to fluxes and gases. Great care has been given to achieve a nicely adjusted balance in each Harbison-Walker brand.

Harbison-Walker representatives welcome the opportunity to assist you in the selection of bonding materials that will provide the best service and economy in your furnaces.



To secure full benefit from the superior properties of refractory brick an equally superior bond is essential.

HARBISON-WALKER BONDS

for every service

AIR-SETTING	Harwaco Bond Coralite Bonding Mortar Korundal Bonding Mortar	High-Alumina
	Firebond—Siliceous	
	Thermolith—Chrome Base	
	Periklase Bonding Mortar H-W Forsterite	Basic
HOT-SETTING	Ankorite—High-Alumina	
	H-W Fine Ground Fire Clays H-W Super Duty-Mortar H-W Special Mortar Mix	Alumina-Silica
	Vega Bond Starbond Star Silica Cement H-W Coke Oven Silica Cement	Siliceous
	H-W 20 Bonding Mortar H-W 26 Bonding Mortar H-W 444 Bonding Mortar	For Insulating Brick
	H-W Furnace Magnesite H-W Special Furnace Chrome	Basic

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REFRACTORIES COMPANY
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SEE —

First Display of All-Metal *Circle* Sifter

This new all-metal gyratory sifter will be *in operation* at the chemical show. Made principally of magnesium this modern sifter resists abrasion and safely handles high temperature chemicals. It's designed for quick product change-over and easy cleaning. Self-balancing drive eliminates harmful vibration. Has high capacity in 4 to 200 mesh range.



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Your Copy of New Chemical Milling Bulletin

This handy, 8-page illustrated bulletin will be a valuable addition to your literature file. It lists money-saving Allis-Chalmers milling equipment for your chemical plant — and shows typical mill flow charts. Get your copy from any A-C representative at the show, or write to our home office. Ask for Chemical Milling bulletin 06B7633.



CONTACT —

Allis-Chalmers *Anytime* for Equipment Aid

It will pay you to discuss your chemical milling and processing problems with Allis-Chalmers because A-C has equipment to help you.

While you're looking at the new *Circle* Sifter, note also the display of Allis-Chalmers pumps, motors, control, and drives — all part of a wide line for the chemical field.

Ask about the *Airset* Roller Mill — the machine with vibrating type feeder and pneumatic operation . . . providing the closest approach to *automatic* milling yet devised! Ask, too, about other A-C roller mills, flaking mills, sifters — and the new double drum dryer.

Sales offices are located in all principal cities. Allis-Chalmers, Milwaukee 1, Wisconsin.

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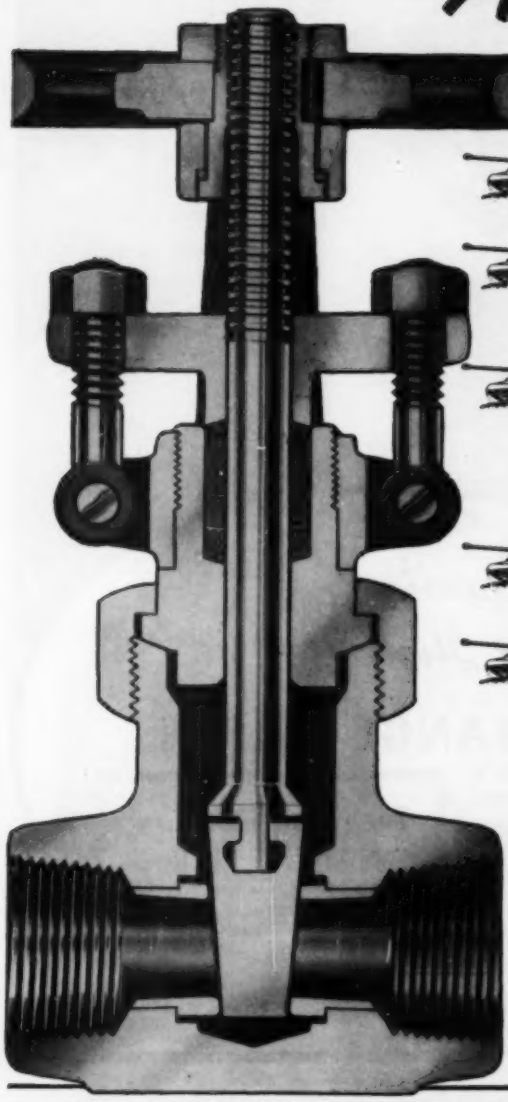
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All 5 Vital Points are ARMORED







Body and Yoke are of Forged Steel, for extra strength and longer life.



Bolted Follower with no follower threads on yoke to corrode. Follower easily tightened down any time when necessary.



Malcomized Gate Faces: When furnished with either 12-14% or 18-8% stainless steel trim, List 960's gates are hardened by "Malcomizing," patented Chapman process. "Malcomizing" hardens to a minimum of 800 Brinnell, which minimizes seizing or galling and lengthens valve life.



Super-Hardened Seat Rings and wedge-faces of stainless steel help to save on repairs and replacements.



Strong Stem and Wedge Connection Extra strength of stem-and-wedge gate connection provides protection against even unusual service stress.

Chapman List 960 is available in sizes from ¼" to 2" . . . in four different alloy-combinations of body and trim which qualify this rugged forged gate valve for many different services. Gasketed joint, or metal-to-metal. Rising stem with yoke (shown) or rising stem inside screw. Pressure range: 2000 lb. at 100°F.—380 lb. at 1000°F. (for higher pressures, specify List 990). Write for illustrated fact-sheet on List 960.



CHAPMAN'S LIST 960 FORGED Gate Valve

The Chapman Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS



✓ High Capacity
✓ Stability at High Temperature

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Here are the basic characteristics of Nalcite HCR which make it the ideal cation exchange material for water softening and many types of ion exchange in process liquids:

- Styrene type resin.
- Either salt or acid regeneration.
- Up to 32,000 grains per cubic foot capacity.
- Full capacity at temperatures up to 250°F.
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Write, today, for the technical bulletin described at right... It may give you valuable ideas for use of Nalcite HCR as a solution to your processing problems.

Technical Data on NALCITE HCR

Complete information on capacities, characteristics, and regeneration data in the sodium cycle. Physical data includes rates of flow, bed expansion, regeneration technique and packaging. Single copies sent free upon request.



When you use Nalcite resins, you take advantage of Nalco's long and broad experience in water and process technology.

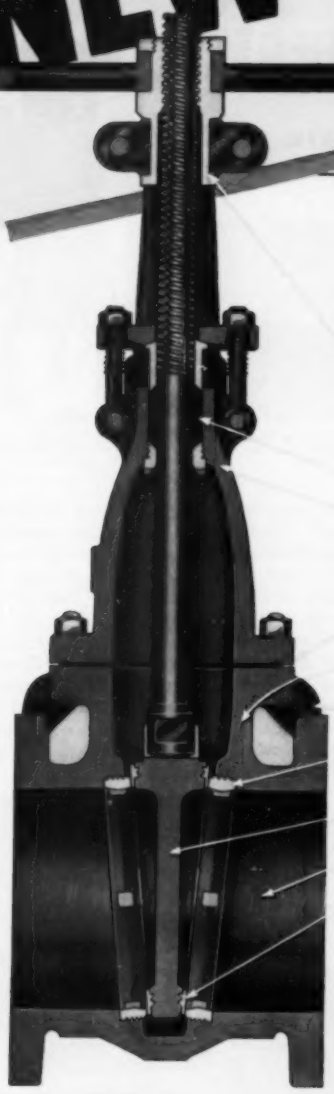
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Examine these construction details:

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8. I-Beam type solid wedge, accurately guided.
9. Straight-through port areas reduce flow resistance.
10. Rolled-in seat facings on wedges give longer life.

OIC's new line of Iron Valves gives you longer service, lower upkeep and greater security. For Bulletin 805 telling you all about them, call your local OIC distributor or write The Ohio Injector Company, Wadsworth, Ohio.

OIC
FOUNDED 1883

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FORGED AND CAST STEEL · IRON · BRONZE



Struthers Wells

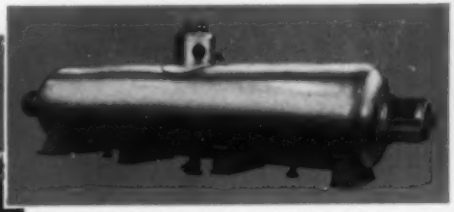
Chemical Processing Equipment

STRUTHERS WELLS 100 YEARS SERVICE TO INDUSTRY 1851-1951 CORPORATION

FOR THE CHEMICAL, RUBBER, PLASTICS, PETROLEUM AND ALLIED INDUSTRIES . . .



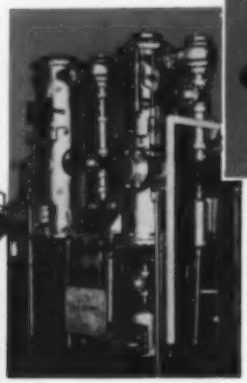
Hydrogenator featuring advanced agitator design for dispersion of gases and solids.



54" dia. x 20'4" long shell devulcanizer, 3500 gal. capacity for 400 psi w.p.

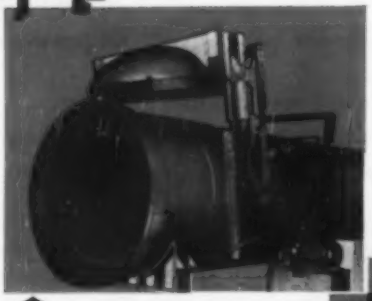
Type CV, vertical circular fired heater.





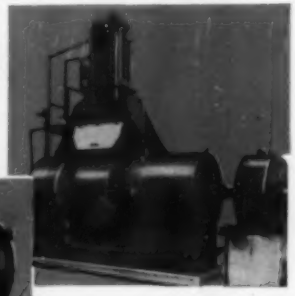
Double effect evaporator.

While a large proportion of our equipment is standard in nature and produced in quantity for conventional needs, we have also built a valued reputation, reflected in high production volume, for the most highly specialized stainless steel and alloy equipment built to meet specific requirements. Whether the demand is for comparatively small pieces of special work, or elaborate construction for some of the largest chemical processing plants in the world, we use the Struthers Wells advantages of research, skill and initiative founded on 100 years of experience to deliver really outstanding service. Get in touch with our nearest branch office or directly with the plant, without obligation, when you have *any* problem involving specialized equipment.



10' I.D. x 85' long Autoclave with hydraulically operated Quick Opening Door.

Intensive mixer. Other mixers made for handling every type of work.



Heat exchanger . . . we manufacture a complete line for the Chemical Process Industries.



STRUTHERS WELLS CORPORATION

Process Equipment Department

PLANTS AT WARREN, PA. and TITUSVILLE, PA.

Representatives in Principal Cities

Carpenter's New Slide Chart Gives Data on Stainless Tubing

Bending information for Stainless Tubing and Pipe shows desirable radii for bends of 45° to 180°.

Coil diameters for Stainless Steel Pipe from ⅛" to 4" are given in easy-to-use form.



The Carpenter Stainless Tubing Slide Chart gives you data on Analyses, Standard Sizes, Bends with and without Mandrels, Tensile Strength, Rockwell Hardness, Heat Resistance, etc.

If you would like a copy of this useful Slide Chart published by Carpenter, just drop us a note on your company letterhead. We'll be glad to put one in the mail for you.

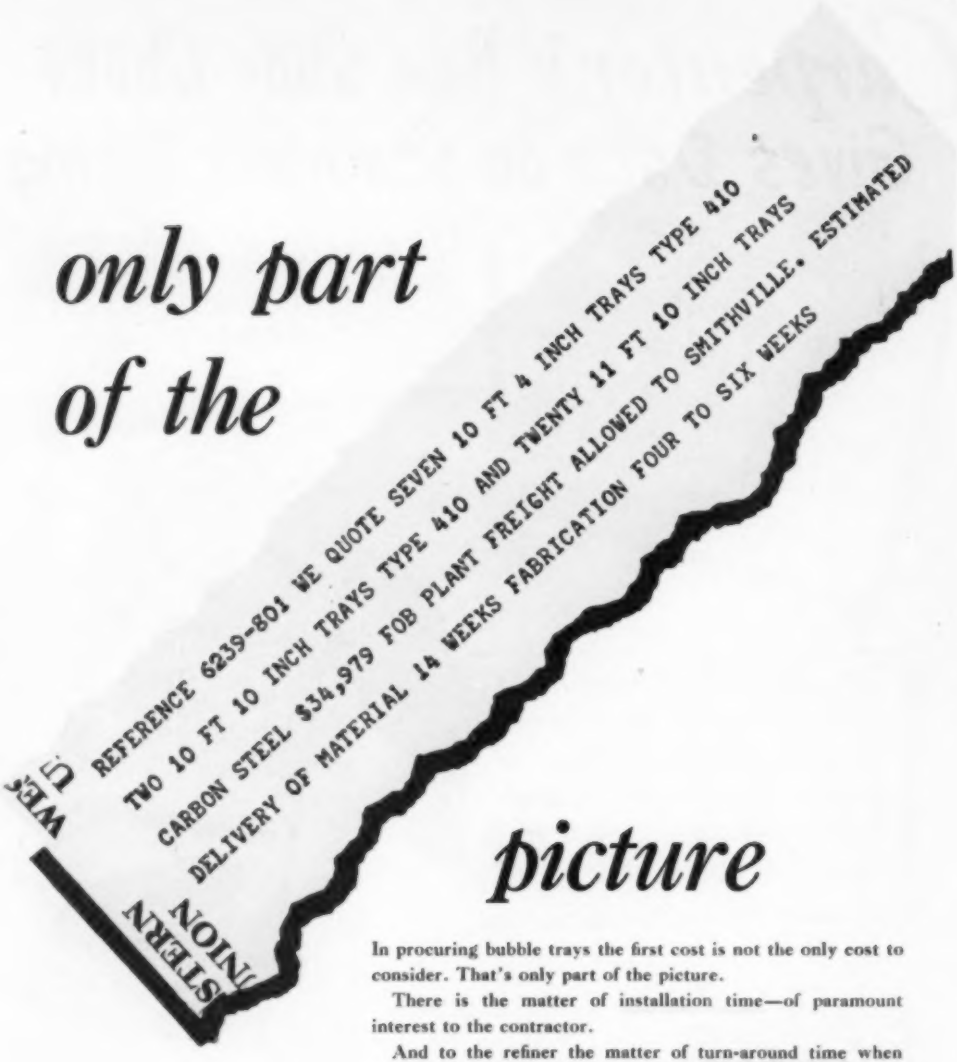
THE CARPENTER STEEL COMPANY
Alloy Tube Division, Union, N. J.
Export Department: Carpenter Steel Co., Reading, Pa.—"CARSTEELCO"

Carpenter
STAINLESS TUBING

Analysis — Tolerance — Finish

— guaranteed on every shipment

only part of the picture



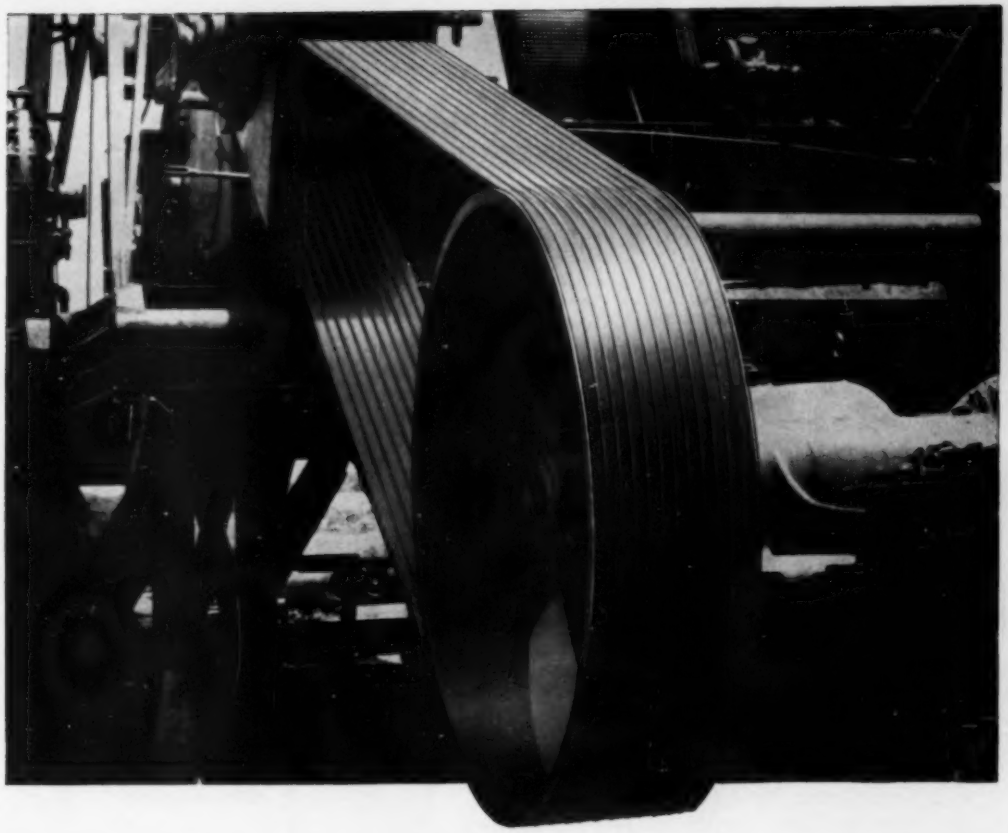
In procuring bubble trays the first cost is not the only cost to consider. That's only part of the picture.

There is the matter of installation time—of paramount interest to the contractor.

And to the refiner the matter of turn-around time when replacements become necessary is of even greater importance.

Exclusive design features of Gilbarco Bubble Trays and Caps that cut installation costs and turn-around time are today's outstanding advance in fractionating tower internals. Let us give you complete information.

GILBERT & BARKER
MANUFACTURING CO.
WEST SPRINGFIELD
MASSACHUSETTS



Next Time You Buy V-Belts Remember:

Bull Dog Compounds do not Crack or Deteriorate Under Severe Flexing!

Bull Dog compounds run cooler and do not crack or deteriorate under severe flexing. This simple fact explains in great part the steady, smooth, *low cost* performance of Bull Dog V-Belts . . . and their longer life! *Remember it — it will pay you well.*

Remember, also, that Bull Dogs are processed for *minimum stretch.* You'll see the operating benefits in reduced slippage and the elimination of repeated adjustments.

Durable Covers are another "more for your money" advantage — and worth remembering. Bull Dog covers are closely woven of heavy, bias cut fabric. They can withstand the punishing wear of the sheave while sealing the belt against moisture, dirt and grease.

Remember, too, that the *specially engineered* BWH cord section is outstanding in high tensile strength. This means you'll get the superior load carrying capacity you want — and the ability to absorb shock loads. What's more, when you install Bull Dogs in sets (and it's highly recommended) you are matching the uniform superiority of one Bull Dog belt with another.

TOUGH PROBLEMS INVITED— Ask us or your nearest BWH distributor about your V-belts, transmission belting, conveyor belting and hose problems. He is a specialist in making rubber products work *better, longer.*



BWH — INDESTRUCTIBLE RUGGEDNESS

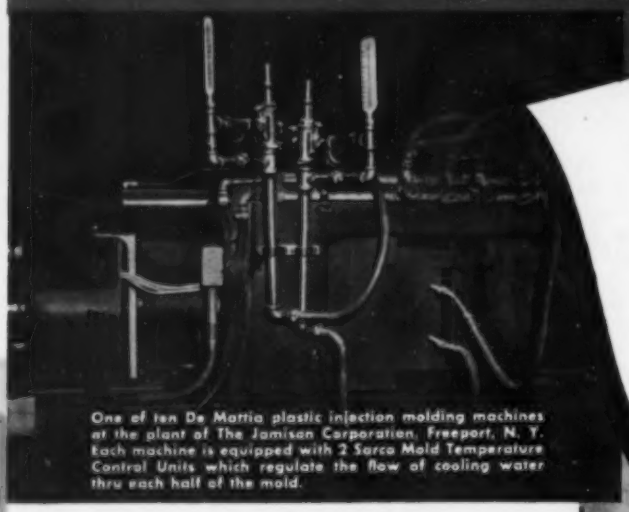
Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois — Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

THIS SIMPLE Cooling Control



One of ten De Mattia plastic injection molding machines at the plant of The Jamisan Corporation, Freeport, N. Y. Each machine is equipped with 2 Sarco Mold Temperature Control Units which regulate the flow of cooling water thru each half of the mold.

"SAVES $25.00 EACH DAY ON EACH MACHINE"

If maximum production of quality plastics is to be secured from an injection molding machine, nothing can be left to chance.

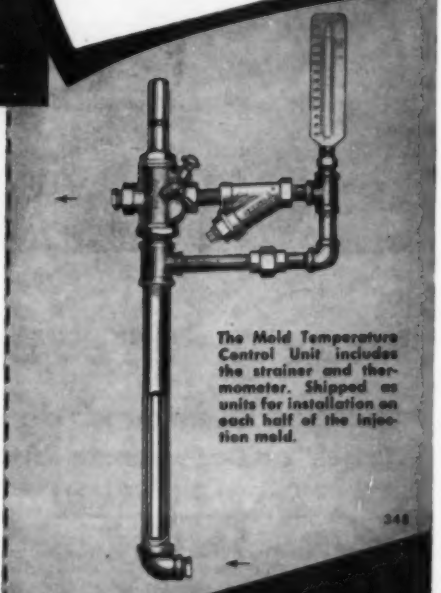
Control must extend not only to raw material, timing cycle and injection pressure – it must include also the temperature of the mold.

SARCO Self-Operated Temperature Regulators

are easily connected to the cooling water system. Constant mold temperature increases production, cuts rejects, and saves water.

Of a similar installation on four machines at Caldwell Products, Inc., New York, Mr. Leaf, Plant Superintendent writes:

"These Sarco controls have been in operation and are wonderful. Increased efficiency saves at least $25.00 each day on each molding machine. In addition, the reduction of rejects has saved us raw materials. As further bonus, we save water."



The Mold Temperature Control Unit includes the strainer and thermometer. Shipped as units for installation on each half of the injection mold.

348

Write today for free copy of Bulletin 704

SARCO COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N. Y.
Represented in Principal Cities
SARCO CANADA LTD., TORONTO 5, ONTARIO

Also used on COOLING SYSTEMS for
AIR COMPRESSORS
SOLVENT STILLS
LIQUID FEEDERS
PIGMENT GRINDERS
DEGREASERS, ETC.

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U.S.I. CHEMICAL NEWS

November ★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1951

Amyl Alcohol with High Optical Rotation Now Available from U.S.I.

For those applications requiring a material with a higher optical rotation than U.S.I.'s refined grade of amyl alcohol, U.S.I. announces the availability of a high rotation amyl alcohol having a minimum specific rotation of −2 degrees. U.S.I.'s exacting standards of manufacture assure users of this alcohol a dependable source of high purity product.

SPECIFICATIONS

Acidity
Free acid as acetic, not more than 0.01%
Color
Water-white
Distillation Range (A.S.T.M.)
Below 128° C. ..... None
Above 132° C. ..... None
Water
None, as shown by the absence of turbidity or separation when 20 volumes of 60° Baumé gasoline are admixed at 20° C.
Non-volatile Matter
Not more than 0.003 gm. per 100 cc.
Odor
Mild, non-residual
Specific Gravity
At 20°/20°C. 0.811-0.815
Specific Optical Rotation
Not less than −2°

Technetium Identified In Solar Spectrum

Technetium, the element so rare that it was never isolated until it was created in the cyclotron, has been detected in the sun's spectrum, according to a recent report. One of technetium's six principal lines agrees with a hitherto unidentified line in the solar spectrum. The other five are either masked by lines of other elements or are located in a region of the sun's spectrum which is unknown. Half-lives of the element's isotopes so far discovered are such that any present in the sun when it was formed would have decayed long ago, it is said.

If the new identification is correct, it is thought that either the element has a longer-lived isotope than any now known or that technetium is continually created in the sun by neutron bombardment of molybdenum, the same process used in the cyclotron.

Improved Magnesium Alloys

Magnesium alloys can be formed by a metallic powder compression process rather than by the conventional method of melting magnesium and other metals together, according to a report recently made available to the public. The new alloying process consists of mixing atomized magnesium powder with powder of the alloying metals and extruding the mixture. This method is said to produce stronger alloys than those of the same compositions made by extruding a melted mixture. As a further advantage, powder extrusion is reported to make possible new alloy compositions not obtainable by melting and casting processes. Many of the new compositions are claimed to have greater strength, improved corrosion resistance, and better fabrication characteristics.

U.S.I. Special Resins Ease Raw Material Shortages For Coatings Manufacturers

Replacements Are Available for Phthalic Alkyds, Modified Maleics, Modified Phenolics, Other Resins

Profiting from experience gained in coping with raw material shortages during World War II, U.S.I. has developed a group of new special resins for various classes of trade sales and industrial finishes in anticipation of possible shortages in materials rated critical. Drawing from their vast technical know-how and war-time experience with shortages, U.S.I. laboratories have developed these new special resins to help protective coatings manufacturers ease the pinch in such important materials as phthalic alkyds, modified maleics, modified phenolics, and castor oil resins.



In announcing the availability of these resins at this time, U.S.I. officials explain that their object is not to create undue concern over the possibility of shortages. Instead, they urge that paint manufacturers begin testing these resins now as alternatives in their formulations in case shortages become acute.

MORE

Cut Water Analysis Time With New Bacteria Filter

Exceptional accuracy and marked savings in time, labor, space, and equipment are claimed for a new method of identifying and counting bacterial colonies in water sanitation studies. Technique involves use of new-type membrane filter discs, approximately 0.1 mm. thick, of nitrocellulose and other materials. Tapered pores, regularly spaced in the discs, can be adjusted in size during formation of the membrane to pass a quart of water in times ranging from less than a minute up to 100 minutes under a pressure of one atmosphere. No bacteria can pass through the filter, it is said, although some viruses may get through.

After bacteria are trapped on the filter, the disc is placed in a petri dish against a special medium which encourages growth of organisms under investigation and represses that of others. Nutrients diffuse through the pores, and on incubation, each bacterium seeds a large, separate colony which can be counted easily because the filter suppresses lateral growth. The new method reportedly simplifies analysis in water bacteriology, cutting time required from several days to a few hours, at the same time allowing use of larger samples than are practical with present techniques.

Book on Soap Manufacture

Publication of a new book directed to both technical and nontechnical workers in the oil, fat, and soap industries has been announced. Beginning with the history of soap manufacture, the book contains step-by-step discussions of all phases of the industry, such as vegetable oils, animal and vegetable fats, soap, shampoo and detergent formulations, saponification processes, fatty acids and glycerine, synthetic surface-active agents, and tests for the evaluation of soaps and analysis of oils and fats. Tables, illustrations, and glossary are included in the new volume.

Textiles from Peanuts

Peanuts may one day be an important wardrobe factor according to reports of a new method for making protein fiber for textiles. In the new process alkali-dissolved protein from peanut meal is extruded into an acid coagulating bath and then treated with formaldehyde. Described as having wool's warmth and moisture-absorption, the new fiber is expected to be used in blends with wool, cotton, viscose staple fiber, and probably with nylon and cellulose acetate.

Photosensitive Glass Is "Machined" Chemically

"Chemical machining" with ultraviolet light, heat, and hydrofluoric acid is said to produce fine, lace-like patterns, hitherto considered impossible, in a new type of glass announced recently. Described as a special kind of photosensitive opal glass, the new composition is the latest in a series of materials designed for producing permanent three-dimensional photographs in glass in a variety of colors. Since chemical machining involves no mechanical stress, patterns otherwise too complex to reproduce can be duplicated in any number, simultaneously and with photographic accuracy, it is claimed.

November ★ **U.S.I. CHEMICAL NEWS** ★ 1951

CONTINUED

Special Resins

The new resins and suggested applications are described below. In all cases it is not possible to equal all the qualities of the resins being replaced. Most of them give an all around performance that is reasonably comparable, however.

AROFLAT 3050-P40, a non-phthalic, non-castor, modified alkyd, flat vehicle (non-penetrating), for self-priming flat wall finishes is superior to conventional oleoresinous calcicoater vehicles.

AROPLAZ 1389-M75 is a non-phthalic, non-castor resin solution with excellent leafing, leaf retention, and package stability for ready-mixed aluminum paints.

AROCHEM 351-M Solution and fortified Ester Gum B-M solution have excellent leafing, leaf retention, and package stability for ready-mixed aluminum paints. They can be mixed with AROPLAZ 1389-M75 for a more economical formulation.

AROPLAZ 1397-M50, a non-phthalic, non-castor, fast drying alkyd is suitable for industrial finishes and utility enamels. It has moderate exterior durability, but is generally recommended for interior use only unless modified or extended.

AROPLAZ 1313-M75, a non-phthalic, non-castor resin solution can replace long-oil alkyds in architectural enamels.

AROCHEM 609, a fast-bodying, high melting point resin can be used with soft oils to produce color-retentive films such as tin deco and other industrial types where maleics are commonly used.

AROCHEM 372 is a new modified phenolic for general utility vehicles for grinding, for floor varnishes, traffic paints, etc.

AROCHEM 547, a modified condensate, is designed for use in sanding sealers and high-grade furniture lacquers where modified maleics are commonly used.

Restore Blood Pressure With Intravenous Gelatin

Gelatin, injected intravenously, is reported to act as an extender for blood plasma and to have helped restore normal blood pressure in 12 cases of hemorrhagic shock during anesthesia and surgery.

Trapped Electrons Cause Heated Crystals to Glow

Electrons, trapped in a crystal lattice by radioactivity—either natural or man-made—may account for the glowing of many minerals when heated in the dark, according to a recent theory. This phenomenon is more common than generally known and can be observed in almost all limestone and granite, it is said. Small amounts of radioactive substances in the mineral are thought to drive electrons into traps in the crystal structure. When the crystal is heated, these electrons fall back to their normal positions and emit light in the process. Since the number of naturally trapped electrons varies with time, it is possible in some cases to estimate the age of certain mineral deposits with this thermo-luminescent principle, it is claimed.

Corncobs Replace Aggregate In Lightweight Concrete For Farm Walls, Floors

Newest use for corncobs is in a lightweight concrete said to be suitable for floors and lightly loaded walls of farm buildings. According to a recent report, corncob pellets can replace coarse aggregate in concrete with good results, so long as pellets are water-soaked and limited to three times the volume of cement used. No bad effects were apparent on a slab of corncob concrete after it was exposed to weather for 15 months, including two winters. Although strength of the concrete suffers, water absorption and heat conductivity are claimed to be less than in ordinary concrete.

New Gas Analysis Manual Gives Theory, Procedures

A new edition of a reference manual, describing the theory and practical application of gas analysis, has been issued. The manual brings together up-to-date information on the subject, as well as illustrations and descriptions of latest equipment. Considerable detail regarding procedures involved in various analyses and complete instructions for maintaining and operating equipment are also given.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

A new resin-based protective liner for steel containers is reported to be resistant to alkalies, dilute mineral acids, chlorinated solvents, formaldehyde, detergents, and fatty acids and emulsions, and is expected to broaden the field of products that can be shipped this way. **(No. 739)**

Wallpaper hanging is easier for homemakers thanks to a new paste which does not ferment, stain, mark or discolor any water-fast wallpaper, according to the manufacturer. **(No. 740)**

A new pre-finished fiber wall panel is claimed to have six times the strength of plaster and two and one-half times the insulation value. Finish is said to last indefinitely, to be washable and waterproof. **(No. 741)**

A new polytetrafluoroethylene stopcock for laboratory apparatus reportedly requires no lubrication, does not contaminate solutions, and will not freeze from strong alkali corrosion. **(No. 742)**

An additive for oil, water, or rubber paints is reported to produce finely textured wall coatings which conceal taped paneling seams and hairline cracks in plaster. Drying time and color are not affected, it is said. **(No. 743)**

Off-center design of a new dropping funnel allows its assembly in a three-necked flask without a supporting clamp and without interfering with the stirrer in the middle neck, it is claimed. A vertically positioned stopcock is an added safety feature. **(No. 744)**

A new detergent concentrate for car washing is packaged in a tube containing enough to wash a car three times, according to the maker. Described as offering a non-streaking wash, harmless to finish, the concentrate can be used in either hard or soft water. **(No. 745)**

A new stainless steel tub-type truck, designed for the chemical, meat, food, and textile industries, has rounded corners, a polished, corrosion-resistant interior, and a 1000-pound capacity, the manufacturer states. **(No. 746)**

For synthesizing alcohol and phenol derivatives, availability of N-bromomethylphthalimide has been announced. The reagent is said to be stable and to form solid, easily purified derivatives, without side products. **(No. 747)**

To prevent tarnishing of silver, brass, gold, copper, and other metal surfaces, a new transparent coating is on the market. Easy application and removal, and resistance to fumes, salt air, alcohols, alkalies, and most acids are claimed. **(No. 748)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)
Ethanol (Ethyl Alcohol)
Specialty Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P., Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous

ANTI-FREEZE
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze

ANSOLS
Ansol* M
Ansol* PR

ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloranilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloranilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.

ACETONE — A.C.S.

FEED PRODUCTS
Carbay 8-G*
DL-Methionine
Riboflavin Concentrates
Special Liquid Carbay*
U.S.I. Vitamin B_{12} and Antibiotic Feed Supplements
Vacatone* 40

RESINS (Synthetic and Natural)
Arochem*—modified types
Arofene*—pure phenolics
Aroflat—for special flat finishes
Aroplaz*—alkyds and allied materials
Congo Gums—raw, fused and esterified
Ester Gums—all types
Natural Resins—all standard grades

INSECTICIDE MATERIALS
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid & Dust
Rotenone Products: Liquid & Dust

INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents

OTHER PRODUCTS
Cellosolves
Ethylene
Nitrocellulose Solutions
Pib*—Liquid Insulation
Urethan, U.S.P.
Special Chemicals and Solvents

*Reg. U.S. Pat. Off.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers Products Corporation

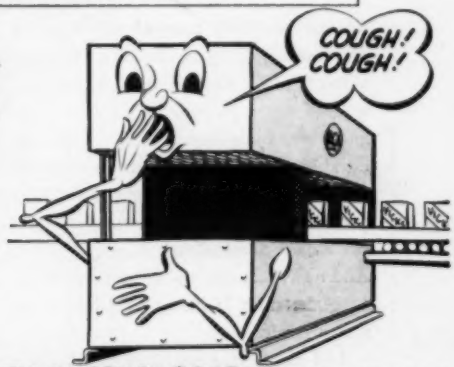
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ERIEZ MANUFACTURING CO., ERIE, PA., U.S.A. • PRODUCERS OF MAGNETIC SEPARATORS AND SELLERS OF (RCA) ELECTRONIC METAL DETECTORS



A LIVE 50 MM. SHELL ABOUT TO GO INTO A PROCESSING PLANT'S HAMMERMILL WAS CAUGHT BY AN **ERIEZ** PLATE-TYPE **ATOM**AGNET. ALTHOUGH THE SHELL WAS 90% BRASS THE MAGNET GRABBED AN IMBEDDED STEEL RIM AND SAVED THE DAY. **ERIEZ** NEW PLATE **ATOM**AGNETS ARE THE MOST POWERFUL EVER BUILT..... CAN BE INSTALLED IN SPOUTS, CHUTES OR SUSPENDED OVER MOVING BELT CONVEYORS. THEY ARE VITAL TO THE PROTECTION OF IRREPLACEABLE EQUIPMENT.



METAL IN COUGH DROPS CERTAINLY STOPS NO THROAT TICKLE. IT'S BAD AND HAS TO BE GUARDED AGAINST. ***THE VICK CHEMICAL COMPANY*** ASSURES ITS PRODUCT PURITY BY USING AN **R.C.A.** METAL DETECTOR, SOLD BY **ERIEZ**... MANY SIZES TO CHOOSE FROM. THIS INSTRUMENT PUTS UP AN ELECTRONIC BARRIER AGAINST ***ANY METAL!***

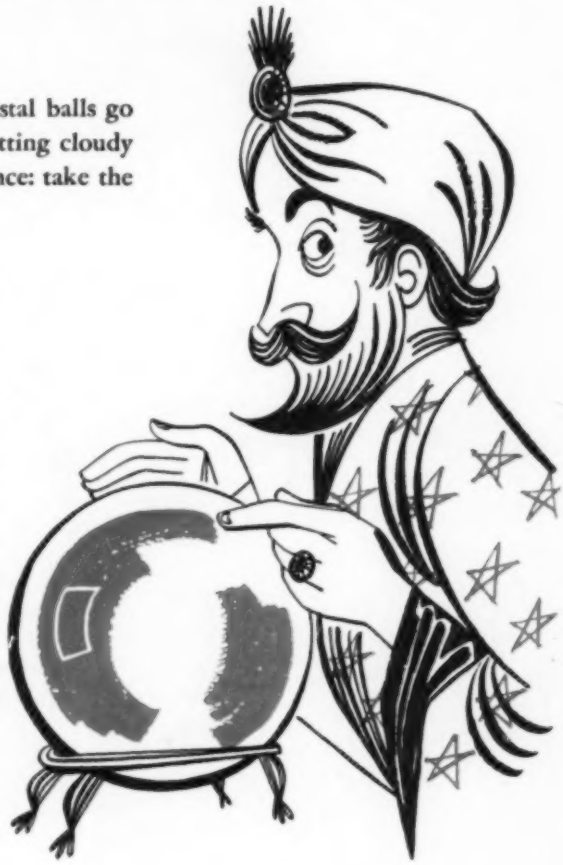


IT'S STRICTLY APPLESAUCE!.... (NO TRAMP METAL IN IT). ***AMERICAN HOME FOODS COMPANY*** INSTALLED AN **ERIEZ** 3" MAGNETIC TRAP IN ITS APPLESAUCE LINE AND SAVED **$6,300** IN REPAIRS AND DOWNTIME IN **9** WEEKS!



FOR SALE!

One (slightly used) Crystal Ball



Not a bad crystal ball . . . as crystal balls go . . . but lately it has a habit of getting cloudy when we need it most. For instance: take the case of VISQUEEN* film.

As you probably remember, VISQUEEN film was originally developed for the specific use of the armed forces. What they wanted was a polyethylene film such as had never been seen before . . . strong, durable, chemically inert, flexible and all the other qualities you know so well . . . a film that would meet rigid specifications yet be economical to use. *They got it!* And now, like many another reserve . . . VISQUEEN film is being called back to active service.

And that's our problem. While our Defense requirements get bigger and bigger . . . our customers delivery will of course dwindle. So we searched our crystal ball. And the only thing we could find is that we will have to ask you to please be patient . . . we're working hard, and we'll work harder to make every effort to fill your orders. You may be cut down . . . but we promise we will do the best we can to get VISQUEEN film to you.

*T.M. The Visking Corporation

IMPORTANT!

VISQUEEN film is all polyethylene, but all polyethylene film is not VISQUEEN. VISQUEEN is the only film produced by the process covered by U. S. Patent No. 2461975. Only VISQUEEN film has the benefit of the research and extensive technical experience of The Visking Corporation, pioneers in the development of polyethylene film. Be sure. Always specify VISQUEEN film for superior tear and tensile strength and greater uniformity.

VISQUEEN Film . . . *A Product of*

THE VISKING CORPORATION

PRESTON DIVISION • TERRE HAUTE, INDIANA

In Canada, Visking Limited, Lindsay, Ontario

Instrument NEWS

ETHYL CORPORATION CUTS TEL TEST TIME WITH G-E X-RAY PHOTOMETER

General Electric's X-Ray Photometer has enabled Ethyl Corporation, Yonkers, N. Y. to cut time and expense in determining the tetraethyl lead (TEL) content of gasoline.

Previous standard methods of analysis require three hours to complete, including 20 minutes of operator time; whereas the G-E X-Ray Photometer requires only 15 minutes for the entire test.

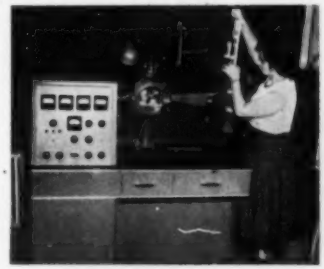
The rapid analysis possible with the X-Ray Photometer has enabled closer control and has freed the chemist from routine work. Sturdy shielding and interlocks provide adequate protection for the operator. The General Electric X-Ray Photometer has maintained high accuracy of results, and the test is non-destructive in nature.



Operator inserts test cell in X-Ray Photometer at Ethyl Corporation, Yonkers, New York.

NAVAL RESEARCH LABORATORY STUDIES SURFACES WITH G-E ELECTRON DIFFRACTION INSTRUMENT

The U.S. Naval Research Laboratory, Washington, D.C., finds a wide variety of experimental applications for the G-E Electron Diffraction Instrument. In operation for approximately two years, the instrument enables the Laboratory to conduct studies and experiments on all types of surfaces.



Electron Diffraction Instrument installed at U. S. Naval Research Laboratory, Washington, D. C. Operator shown loading camera in preparation for sample study. (Official United States Navy Photograph.)

With the General Electric Electron Diffraction Instrument, surface studies of corrosion, and organic film adsorption are made, leading to the development of new materials by the Lubrication Branch of the Chemistry Division. This is one of the units used at the Naval Research Laboratory at this time (left).

A leading feature of the instrument is its large specimen chamber. This makes it unnecessary to cut up specimens. Testing is non-destructive and valuable samples are preserved. The unit enables the study of systems at various stages of the experiments.

Great versatility is achieved by variable beam voltage, which can be adjusted to a maximum of 50,000 volts. The Naval Research Laboratory finds it advantageous to operate at 35,000 volts, for their work.



ESSO INSTALLS A G-E MASS SPECTROMETER

At the Esso Research Center, Linden, N. J., the G-E mass spectrometer has proven valuable in the solution of difficult analytical problems arising in connection with petroleum processes, products and derivatives. Advantage is taken of its high resolving power in the analysis of a wide variety of materials. Direct recording is a very useful feature.

DEWPOINT RECORDER CHECKS MOISTURE FOR CHRYSLER AIRTEMP

Better moisture control of air used for drying refrigerator coils, has been achieved with a G-E Dewpoint Recorder, installed at Chrysler Airtemp Division, Chrysler Corporation, Dayton, Ohio.

Large dehydrating equipment supplies dry air for this operation. With the Dewpoint Recorder, a continuous check and permanent record is kept of the moisture content of the air before it enters the coils, resulting in savings in material and labor.

The G-E device replaced a test which was slow and used large amounts of CO_2.

NEW 1952 CATALOG



NOW AVAILABLE

"MEASURING EQUIPMENT for laboratory and production testing"

CLIP THE COUPON BELOW

General Electric Co., Section E 687-81
Schenectady, N. Y.

(√) Indicate for reference only
(X) For planning an immediate project

Please send me the following bulletins:

- ☐ GEC-412A—X-Ray Photometer
- ☐ GEC-587—Mass Spectrometer
- ☐ GEC-588—Dewpoint Recorder
- ☐ GEC-656—Electron Diffraction Inst.
- ☐ GEC-1016—New 1952 Catalog

Name .....
Address .....
Company .....
City ..... State .....

GENERAL ELECTRIC

Here's Taylor's



2. Change from direct to reverse action is made easily, quickly by rotating top plate without disturbing any pipe connections.

1. Single knob adjustment of both proportional and reset control responses provides simple, quick stability "tune-in".

3. Plug-in manifold, with self-sealing valves, provides simple means for connecting or removing controller without disturbing pipe connections (optional).

5. Cover plate protects control knob from elements, damage, and tampering.

4. Integral cut-off relay on every Bi-Act, permits panel or field mounting.

New BI-ACT* CONTROLLER

Gives you single knob adjustment of both proportional and reset!

Here's a new, inexpensive force-balance controller incorporating a new control circuit. *One* stability knob adjusts *both* proportional and automatic reset responses. It's adaptable to practically any process . . . flow, pressure, liquid level and temperature . . . and particularly suited to applications requiring fast reset rates and broad proportional bands.

The BI-ACT CONTROLLER can be panel or field mounted. It can be changed from direct to reverse action and, with optional manifold, removed entirely without disturbing piping connections. SPECIFICATIONS: Gain 100 to .5 (Throttling range 1% to 200%) Automatic reset .1 to 120 repeats per minute. Size 7½" overall length. Standard operating range 3 to 15 psi. High capacity air valve.

This new BI-ACT CONTROLLER is the latest addition to Taylor's famous TRANSET* CONTROL SYSTEM, the new concept in pneumatic transmission control that is the talk of industry. Three component units, TRANSAIRE* TRANSMITTERS, TRI-ACT* or BI-ACT* CONTROLLERS and TRANSET* RECORDERS or INDICATORS, work together as a team to take full advantage of each others' superior performance in controlling practically any process variable.

For full details ask your Taylor Field Engineer, or write for Bulletin 98070. Taylor Instrument Companies, Rochester 1, N. Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

Taylor's Centennial ACCURACY FIRST SINCE 1851

*Trade-Mark

Taylor Instruments MEAN ACCURACY FIRST IN HOME AND INDUSTRY



FOR LOW-COST MAINTENANCE with the greatest of ease!

See how Darling cast steel gate valves save you time and money!

YOU know how important low-cost, *easy* maintenance can be. It's one of many Darling Valve features worth shouting about.

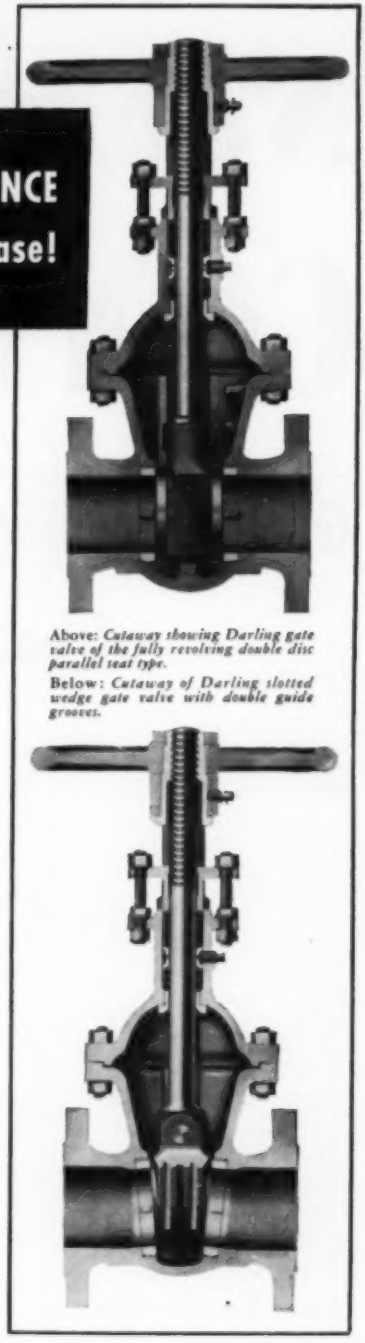
For example, all *Darling* parts are precision-made to jigs and templates. Replacement parts slip in quickly and easily.

What's more, Darling valves are designed so that seat rings and all working parts are easily removed and replaced without taking the valve bodies from the line.

These maintenance and repair advantages, plus many other time-and-money-saving features, apply to Darling gate valves of both popular types shown at right. It adds up to low-cost performance at its over-all *best!* Ask for the Darling Cast Steel Valve Bulletin. Get *all* the facts so you can judge for yourself!



FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN



Above: *Cutaway showing Darling gate valve of the fully revolving double disc parallel seat type.*

Below: *Cutaway of Darling slotted wedge gate valve with double guide grooves.*

FOR EVERY NEED. *Darling gate valves are made in a wide range of sizes, types and constructions for all kinds of normal and unusual service . . . and for pressures up to 1500 pounds.*

DARLING VALVE & MANUFACTURING CO.

Williamsport 3, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.



BLOCKSON
Sodium Phosphates

As leading primary producers of Sodium Phosphates, Blockson has made substantial plant additions in its endeavors to keep up with the increasing Sodium Phosphate demands of American industry.

BLOCKSON CHEMICAL COMPANY
JOLIET, ILLINOIS

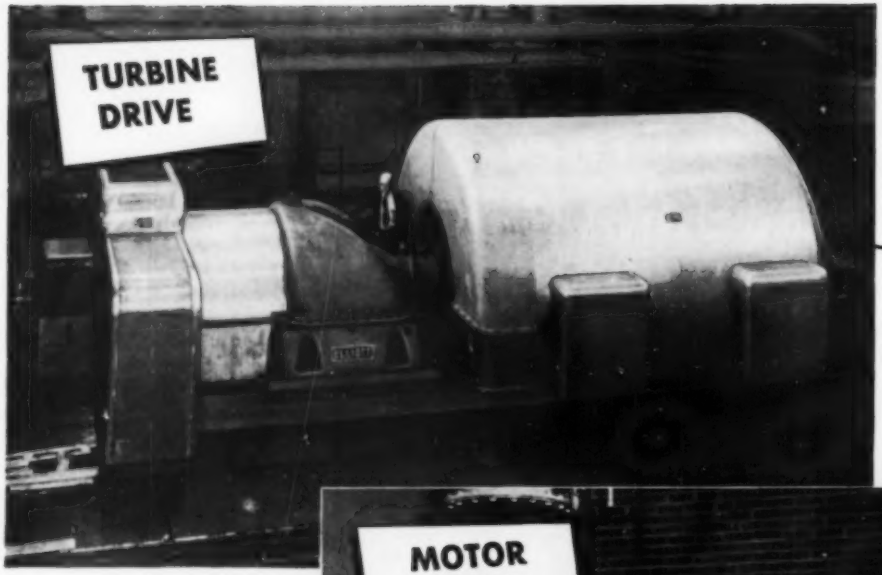


Blockson Plant . . . Joliet, Ill.

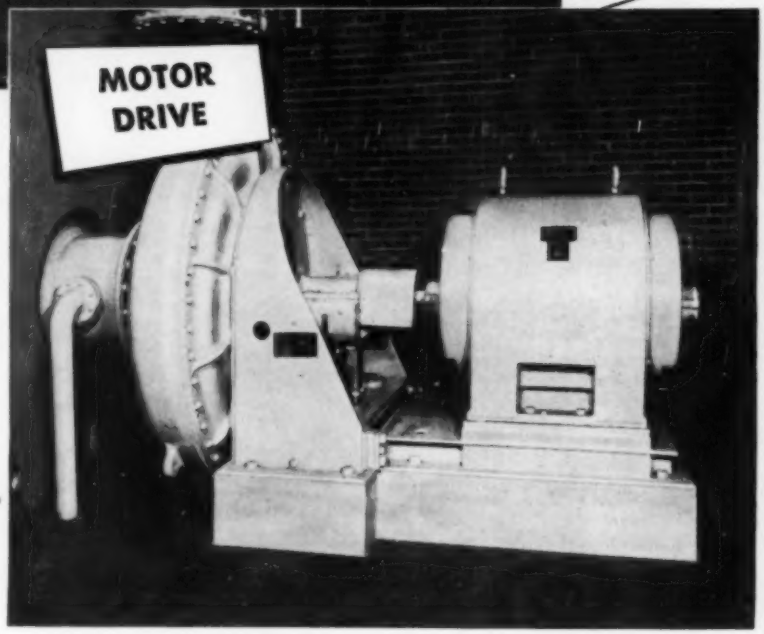
- Sodium Tripolyphosphate
- Tetrasodium Pyrophosphate, Anhydrous
- Sodium Polyphos (Sodium Hexametaphosphate) (Sodium Tetraphosphate)
- Trisodium Phosphate, Crystalline
- Chlorinated Trisodium Phosphate
- Trisodium Phosphate, Monohydrate
- Disodium Phosphate, Anyhdrous
- Disodium Phosphate, Crystalline
- Monosodium Phosphate, Anhydrous
- Monosodium Phosphate, Monohydrate
- Sodium Acid Pyrophosphate
- Sodium Silicofluoride
- Sodium Fluoride
- Hygrade Fertilizer

BLOCKSON

Conditions dictate *the unit is*



Blast furnace blower rated 100,000 cfm at 30 psig, driven by an Elliott 11,000-hp turbine.



Elliott direct-connected, motor-driven single-stage blowers like this are available for capacities of 5000 cfm and up, and pressures up to 3.75 psig or more at speed of 3550 rpm.

the drive but . . .

ALL ELLIOTT!

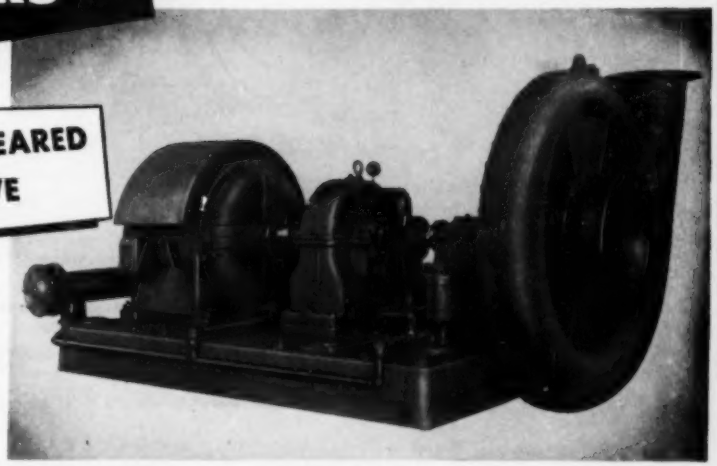
CENTRIFUGAL BLOWERS AND COMPRESSORS are built by Elliott Company complete with turbine, motor, or motor geared drive and with condensing equipment and other auxiliary apparatus.

These blowers are custom-built to the purchaser's exact requirements of capacity and pressure, emphasizing high efficiency and minimum space requirements. Low maintenance is assured by conservative design and the use of materials adapted to the specific requirements. Extremely rigid construction of the rotor and equally rugged construction of the baseplate result in almost complete absence of vibration.

Whatever the drive required, select an Elliott unit and make sure of a completely integrated installation, with essential parts *mated* for top-quality performance and low upkeep, backed by the Elliott reputation from end to end. Write us for details on the blower unit you need.

ELLIOTT CENTRIFUGAL BLOWERS

MOTOR GEARED DRIVE



Elliott motor-driven blowers are available for higher pressures, equipped with a step-up gear unit between motor and blower.

ELLIOTT Company

1901 — 1951

CENTRIFUGAL BLOWER DEPT., JEANNETTE, PA.

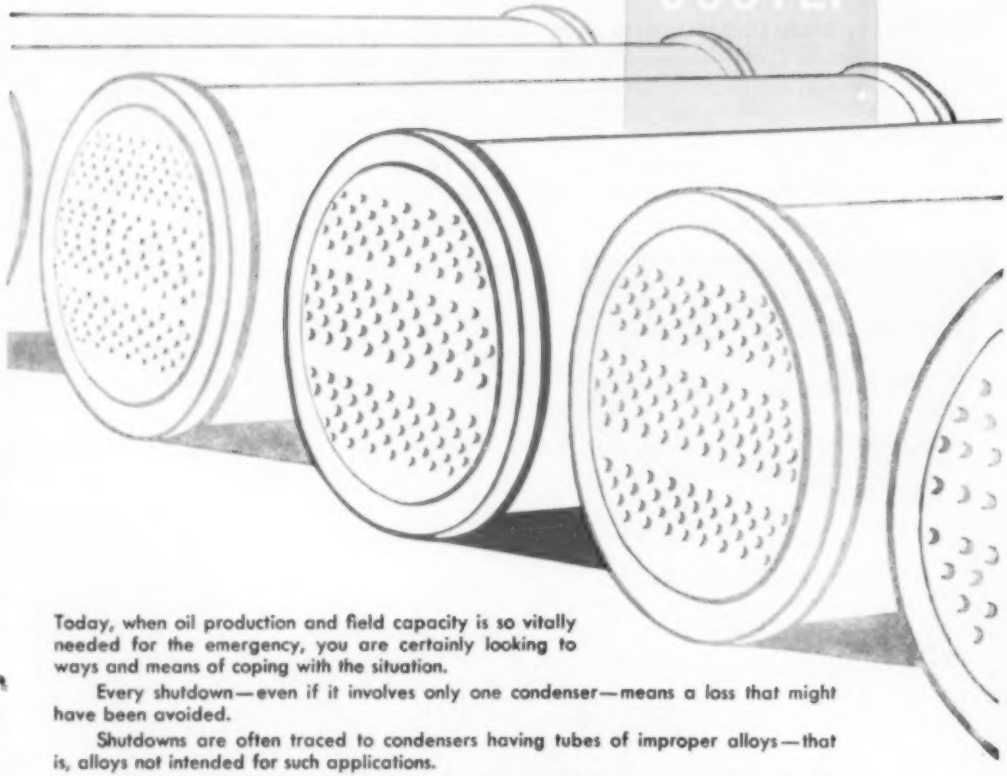
Plants at: JEANNETTE, PA. • RIDGWAY, PA. • AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.

DISTRICT OFFICES IN PRINCIPAL CITIES

P-1095

Losing efficiency

of even one condenser is COSTLY



Today, when oil production and field capacity is so vitally needed for the emergency, you are certainly looking to ways and means of coping with the situation.

Every shutdown—even if it involves only one condenser—means a loss that might have been avoided.

Shutdowns are often traced to condensers having tubes of improper alloys—that is, alloys not intended for such applications.

Wolverine can provide condenser tubes in a variety of alloys and can counsel with you as to the best one to use under your prevailing conditions.

Let us help you in the selection of proper alloys to do the most efficient job for you.

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, nonferrous tubing
1427 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Wolverine Condenser Tubes stocked by Butler Industries, Inc., 355 South Fourth Street, Beaumont, Texas • Tel.: Beaumont 3-2351

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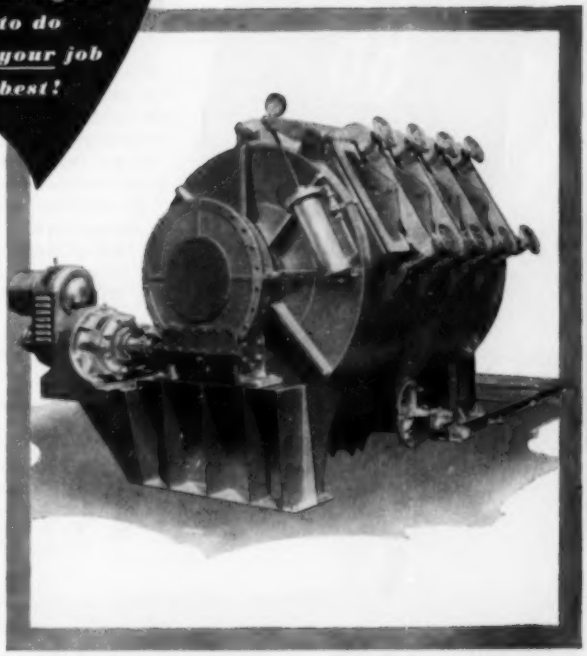
See General American for

CREATIVE FILTER ENGINEERING

See us at the General American Display at the 23rd Exposition of Chemical Industries, Booths 285 and 287

You never have to open a Conkey Rotary Leaf Pressure Filter during regular operating cycle

Designed to do your job best!



Because slow rotation of filter leaves in the slurry prevents separation (settling out) of solids, and insures formation of a uniform cake structure of even thickness and high washing efficiency, with positive cake discharge, you never need open a Conkey Rotary Leaf Pressure Filter during regular operation for cake discharge or other cyclic requirement. Thus very considerable savings in filter cloth and labor are effected.

Volatile or dangerous liquids may be handled safely. Operating cycles are economical. Cake building, cake washing and dewatering are independent and consonant with optimum requirements of each filtration.

Filter leaves—sectored and easily removable – permit filter to be dressed with cotton fabric, while quick-opening ports permit replacement of any sector requiring re-dressing. Cloth replacement requirements can be readily and positively identified through filtrate sample cocks or observation tubes. For complete data relative to various applications of this superior filter, write for technical bulletin No. 105.

Other General American Equipment:
Turbo-Mixers, Evaporators, Dewaterers, Dryers, Towers, Tanks, Bins, Pressure Vessels

OFFICES IN ALL PRINCIPAL CITIES

PROCESS EQUIPMENT DIVISION GENERAL AMERICAN TRADE MARK

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In Canada: Canadian Locomotive Co., Ltd., Kingston, Ont.



BOOTH 66 at the CHEMICAL SHOW

MANY THOUSANDS *plus*

Yes, many thousand Oliver United filters, made up of the following types, are serving industries all over the world. Each filter has distinctly different design features; each has one or more exclusive filtering advantages.

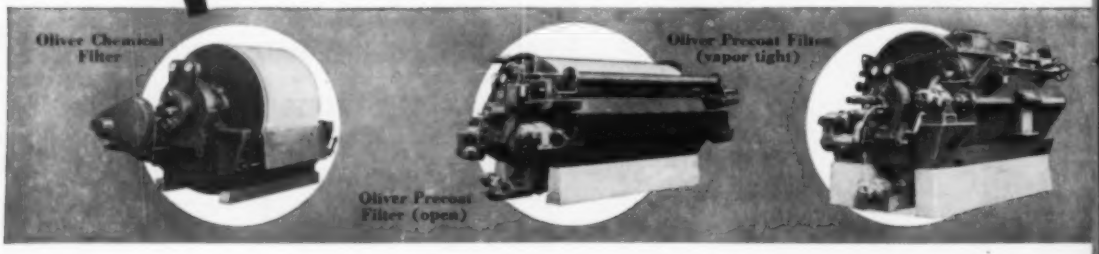
Oliver Chemical Filter • Oliver Pulp Type Filter
Oliver Metallurgical Filter • Oliver Ringvalve Filter
Oliver Precoat Filter—(open) • Oliver Board Former
Oliver Precoat Filter—(hooded) • Oliver Top-Feed Filter
Oliver Precoat Filter—(continuous pressure) • American Disc Type Filter
Oliver Panel Filter • Dorreo Filter (internal drum)
Oliver Sewage Sludge Filter • Sweetland Pressure Filter
Oliver-Campbell Cane Mud Filter • Kelly Pressure Filter
Oliver String Filter • Kelly Sulphur Filter
Oliver Synrub Filter • Oliver Pressure Filter
Oliver-Beatty Pressure Filter

■

All of these filters are available in a wide range of sizes; several have sizes especially for laboratory or pilot plant work.

■

And many hundreds of Olivite Corrosion Resistant Centrifugal Pumps and ODS Diaphragm Slurry Pumps are also serving industry. Both are available in a range of sizes. We'll be glad to have you bring your pumping problem to us in Booth 66 where our engineers may be of help.



FILTRATION HEADQUARTERS

■ **Place your own valuation on this Oliver United fact: here you can find the greatest composite filtration experience and the most diversified individual specialization.**

■ **Place your own valuation on this other Oliver United fact: here you can find the greatest variety of filter types designed and manufactured by a single company anywhere.**

You're interested in arriving at the best solution to your filtration or clarification problem . . . best from the standpoint of dewatering, washing, durability, maintenance and general overall costs. In short, best results at the lowest per ton cost!

■

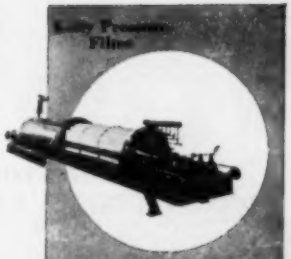
The simple question is: where are you most likely to find this best solution to your problem most quickly? Isn't it where you will find *experience* in its fullest measure and *filter types* in the greatest variety?

■

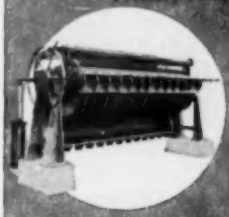
It has meant much to thousands of Oliver United customers that we are able to draw on hundreds of case studies in seeking the answer. It has meant much that we could discuss, with the filter to back up our recommendation, the application of all three basic procedures: (1) continuous vacuum filtration; (2) continuous pressure filtration and (3) batch pressure filtration.

■

All of this help and guidance, built up over a period of 44 years of filtration service to the process industries, can be contacted personally at the Chemical Show, Booth 66, any time from November 26th to December 1st. So, if you are coming to the Chemical Show, drop in, we shall be glad to help you in any way we can. If you can't make it, write us about your problem in detail. We'll be glad to give you the same prompt service.



Sweetland Pressure Filter



Oliver Precoat Filter (continuous pressure)



New York 18 — 33 W. 42nd St. Chicago 1 — 221 N. LaSalle St.
Oakland 1 — 2900 Glascock St. San Francisco 11 — 260 Calif. St.
Export Sales Office — New York • Cable — OLIUNIFILT

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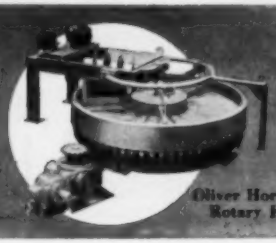
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The Dorr Co.
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AUSTRALIA
Hobart Duff Pty., Ltd.
Melbourne

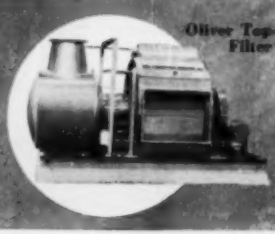
SOUTH AFRICA
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Johannesburg, Transvaal



Oliver Panel Filter



Oliver Horizontal Rotary Filter



Oliver Top-Feed Filter

FOR INFORMATION ON DRY MATERIALS HANDLING



this is a step in the right direction

If you've got time at the Chemical Show, take it all in. But if your hours are rationed, don't fail to visit Fuller. Here you can get field-tested data on cost-cutting, time-saving, more efficient methods of materials handling . . . practical pneumatic conveying systems such as the Airveyor, the F-H Airslide, and the Fuller-Kinyon system.

Here, too, you'll find the outstanding Fuller Inclined-Grate Cooler and the minimum-maintenance Fuller Rotary Air Compressor.

Stop in at Booth 315-317. Our engineer-representatives will be happy to discuss your conveying problems. If you have no present conveying problem, drop in anyway—you may pick up a valuable idea.





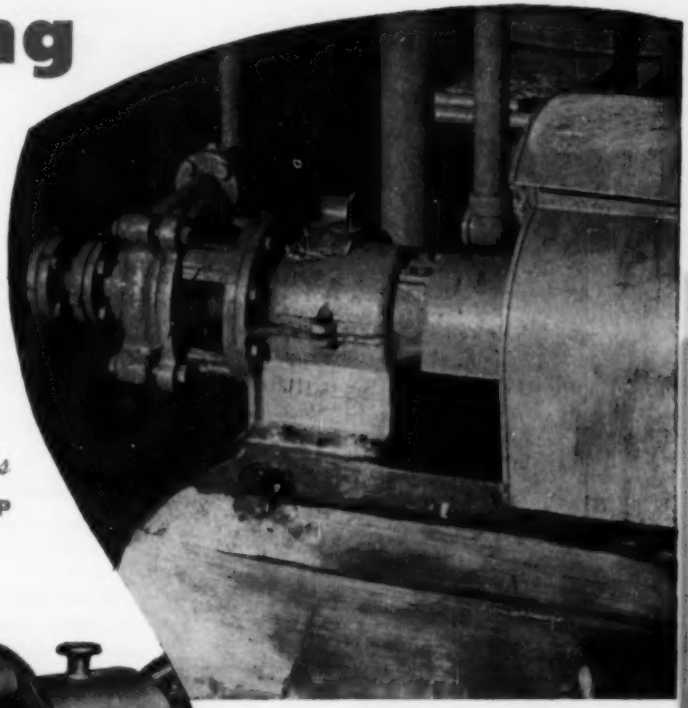
Fuller

FULLER COMPANY, Catasauqua, Pa.
120 S. LaSalle St.—Chicago 3
420 Chancery Bldg.—San Francisco 4

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—COMPRESSORS AND VACUUM PUMPS—FEEDERS AND ASSOCIATED EQUIPMENT

G-89

Intermittent pumping



The WILFLEY Acid Pump at right, one of several in an Eastern acid plant, is intermittently pumping chlorine-saturated sulphuric acid, 90-93% concentration, at atmosphere temperature. WILFLEY'S exclusive design and construction make this pump a real cost-saver on this type of application.

Companion to the famous
WILFLEY SAND PUMP



Absolute dependability under the pressure of 24-hour-a-day service has established WILFLEY Acid Pump as the leader in its field. This pump definitely increases production and saves costs in handling corrosives, hot liquids, mild abrasives and other solutions. 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. Wetted parts of practically all machinable alloys. Plastic lined models available. Individual engineering on every application. Write or wire for complete details.

A. R. WILFLEY & SONS, INC., DENVER, COLO., U.S.A.
New York Office: 1775 Broadway, New York City

WILFLEY *Acid* PUMPS

NICKEL keeps the product pure in gelatin processing



Jacketed pressure vessels, made of Nickel-Clad Steel, used in the extraction of gelatin. The vessels were designed in accordance with the ASME code for pressure vessels, Par U-69. The entire plant was designed and built by ARTISAN METAL PRODUCTS, INC., Boston, Mass.

Gelatin ... essential to modern photography and favorite edible of millions ... must be *pure* to meet today's exacting standards.

For many applications, including photography, even a slight amount of metallic contamination cannot be tolerated in gelatin. To further complicate production problems, gelatin is highly susceptible to contamination from metal vessels and processing equipment.

Large producers of gelatin have reduced metal pick-up to a negligible amount by using Nickel and Lukens Nickel-Clad Steel for processing tanks, evaporators, and pressure vessels. Nickel is highly corrosion-resistant and protects gelatin from harmful metallic contamination.

In the most recently built gelatin plant, Nickel and Nickel alloys were used throughout, wherever metal surfaces were in contact with the gelatin.

Inconel Solves Still Another Problem

In the production of sheet gelatin, a water solution is flowed over metal drying nets stretched on wooden frames. The nets are then stacked, and warm air is blown over them to drive off water.

When dry, the gelatin is dumped off the nets. If the sheet adheres, the net fabric is struck with a leather thong ... and here is where a maintenance problem developed.

Repeated striking stretches ordinary netting and causes eventual failure. Nets made of strong, corrosion-resistant Inconel solved the problem and have been in use for more than ten years ... *outlasting previous net materials many times.*

Right now, Nickel and Nickel Alloys are being diverted to defense, but Inco's Technical Service Department is always ready to help you with your special metal failure problems ... write today, giving full details.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

*Reg. U.S. Pat. Off.

USE PURE *Nickel* WHERE PURITY COUNTS



Solid Inconel tanks used in first stage of producing edible gelatin. Tanks are 42" O.D. with ⅛" wall. Covers are flanged and ducts are 4" I.P.S. Inconel Pipe Bends. Fabricated by ARTISAN METAL PRODUCTS, INC., Boston, Mass.

MEMO

The Hagan Ring Balance Dual Meter is the most adaptable flow meter made . . .



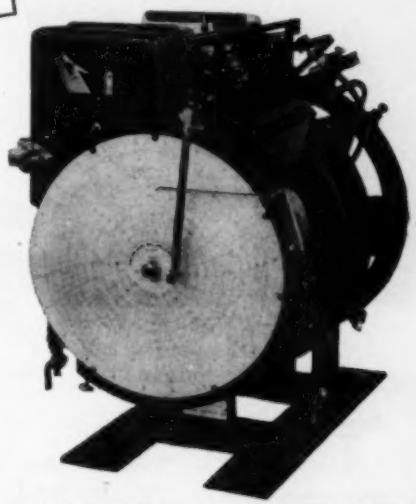
and here are four typical applications:

1. MEASURE TWO INDEPENDENT FLOWS: The Hagan Ring Balance Dual Ring Flow Meter will record two rates of flow on one chart, as, for example, steam flow and air flow, or gas flow and air flow.

2. MEASURE TWO FLOWS SEPARATELY, ADD AUTOMATICALLY: The Hagan Ring Balance Dual Ring Flow Meter will record flows from two separate lines, and integrate and record the total flow.

3. MEASURE TWO FLOWS SEPARATELY, SUBTRACT AUTOMATICALLY: For split flows, The Hagan Ring Balance Dual Ring Flow Meter will measure the main flow and the flow through one branch, record these flows and the difference between them, (this difference being the flow through the second branch), and will integrate any two flows automatically.

4. FLOW MEASUREMENT CORRECTIONS AUTOMATICALLY MADE ON BASIS OF GRAVITY OR DENSITY: One unit of the Hagan Ring Balance Dual Ring Flow Meter measures flow, the other measures gravity of a liquid or gas density. Records may show corrected or uncorrected flow rates, gravity or density measurement, with automatic integration of either flow rate.



The Hagan Ring Balance Dual Ring Flow Meter may also be compensated automatically for temperature and pressure factors.

For information on how Hagan Ring Balance Meters can solve your particular metering problem, write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

HAGAN CORPORATION

RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THRUSTORQ FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS



"I believe in being honest and telling you

Exactly What I Think About This Bag Closer"



Model ET applies famous "Cushion-Stitch" over dry tape for sift-proof closure. Model E-1 applies "Cushion-Stitch" only, for use where sift-proofing is not essential.

For full details, write today for booklet 280E

"I bought a Model ET Bagpaker® — the one that applies the 'Cushion Stitch' over a dry tape. It makes a neat, strong, sift-free closure. The machine is of welded steel construction throughout — well built — I don't think it will ever wear out. It takes care of up to 15 bags per minute, and only one man is needed to operate it.

"The thing I like best about the Model ET is that it hasn't given me a bit of trouble — no breakdowns or delays. It purrs right along minding its own business. I'm sold on it."

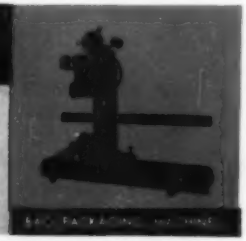


BAGPAK MULTIWALL BAGS

International Paper Company

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MPS-500

some things you will want to know about this new low-cost vinyl plasticizer

what it is

MPS-500 is a stabilized, chlorinated ester of a fatty acid, in which the chlorine content is controlled to give best balance between compatibility and plasticizing efficiency.

its chief advantages

MPS-500 is lower in cost than most primary plasticizers. It shows excellent compatibility with vinyl chloride polymers and copolymers, is highly permanent and flame retardant.

qualities it can impart to your product

- Flame retardance
- High resistance to water, oil, gasoline
- High permanence on heating
- Excellent electrical properties
- High tensile strength at high flexibility
- Low migration

what you can use it for

- Transparent and opaque films
- Upholstery and drapery
- Shoe soles
- Electrical insulation
- Hose covering
- Organisol and Plastisol formulations
- Softener for nitrile rubbers



BULLETIN 35 gives you properties of MPS-500; comparisons with other plasticizers; detailed test data; typical formulations and uses. Write today, on your company letterhead, for a copy.

From the Salt of the Earth

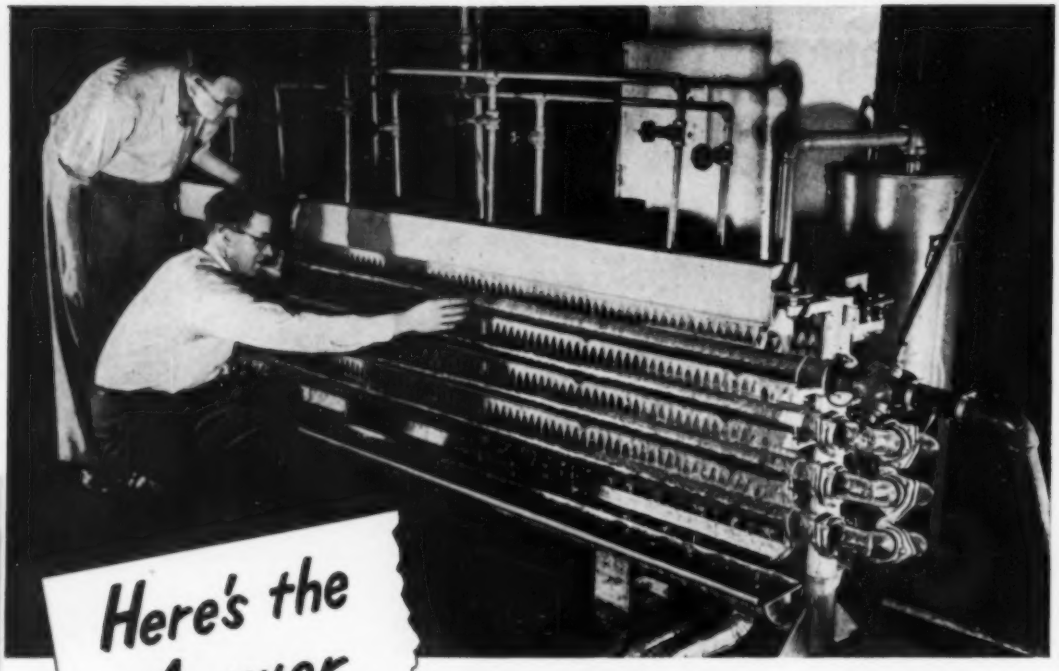
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HOOKER CHEMICALS

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BENZOIC ACID • CHLOROTOLUENE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • CHLORINATED PARAFFIN • CHLORINE



Here's the Answer

to Cooling Corrosive Liquids

PYREX® Cascade

CORROSION RESISTANT—PREVENT CONTAMINATION—LOW IN COST

PYREX Cascade Glass Coolers offer the ideal solution to problems of cooling corrosive chemicals, foods, medicinals—any product which attacks usual piping materials or is susceptible to contamination.

MADE OF PYREX BRAND GLASS NO. 7740, the tubes are exceptionally heat and corrosion resistant—can be used with any fluid except hydrofluoric acid and extremely strong caustics. Chemical stability is excellent. And the "glass-smooth" surface resists scale formation—keeps efficiency up, makes cleaning easy, minimizes maintenance costs. Transparency permits visual inspection at all times.

LOW IN FIRST COST per BTU transferred, the exceptionally long service life of PYREX Cascade Coolers further increases economy. What's more, they can be operated with low-cost sea or river water, and there's no coolant pumping problem as with other types of coolers.

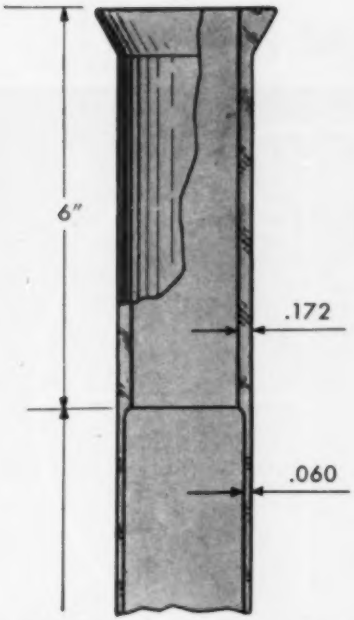
UNUSUALLY VERSATILE, PYREX Cascade Coolers can be mounted on floor, wall or ceiling to conserve valuable space. The units can be used in series or parallel if larger capacities are required. Shipped complete, except for a few parts easily obtained locally, only eight man hours are required to level and completely assemble an eight-tube unit.

A new technical bulletin, "PYREX Cascade Coolers," explains how you can easily calculate requirements for any cooling job. Send for it.

PYREX

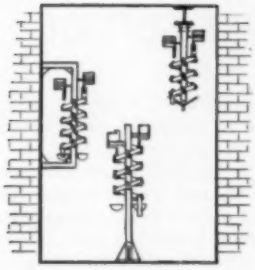
CORNING GLASS WORKS CORNING, N. Y.

1851 • 100 YEARS OF MAKING GLASS BETTER AND MORE USEFUL • 1951



The tubing used in PYREX Cascade Coolers is made with extra strong heat treated ends, and special thin walls for maximum heat transfer.

Coolers . .



Versatile PYREX Cascade Coolers can be installed on wall, floor or ceiling where space is at a premium.

Corning means research in Glass

Keep Processing Costs Down With PYREX brand "Double-Tough" Glass Pipe

For over 25 years, processors and manufacturers have found PYREX brand Glass Pipe the practical and economical solution to problems of transferring corrosive or sensitive liquids and gases. Its high corrosion and heat resistance, and chemical stability mean long service life under the most severe conditions.

Its ease of cleaning keeps maintenance costs down. And the transparency of PYREX pipe gives you a constant visual check on flow, crystallization and sedimentation—trouble can't hide behind glass. Available in diameters from 1" to 6".

PYREX Cascade Coolers and Pipe available through these distributers

A. J. Eckert Company
Albany 5, New York

Glass Engineering Laboratories
Belmont, California

Macalaster Bicknell Company
Cambridge 39, Massachusetts

Fred S. Hickey, Inc.
Chicago 44, Illinois

Valley Foundry & Machine Works
Fresno 17, California

Sentinel Glass Company
Hatboro, Pennsylvania

W. H. Curtin Company
Houston 7, Texas

Fisher Scientific Company
Montreal 3, Quebec, Canada

Scientific Supplies
Seattle 4, Washington

Stemmerich Supply Inc.
St. Louis 2, Missouri

Mooney Bros. Corp.
Teterboro, New Jersey

Will Corporation
Rochester 3, New York

See the new PYREX Cascade Cooler along with PYREX Pipe at the CHEMICAL INDUSTRIES EXPOSITION, Grand Central Palace, November 26-30.

New Technical Bulletin Just Off The Press!

A new Technical Bulletin is now available which completely describes PYREX Cascade Coolers. It includes a series of handy tables and nomographs which enable you to readily compute your heat transfer requirements. For your copy, just fill out and mail the coupon below today!



CORNING GLASS WORKS, Dept. CE-11, Corning, N. Y.

Please send me a copy of Technical Bulletin PE-8, "Pyrex Cascade Coolers."

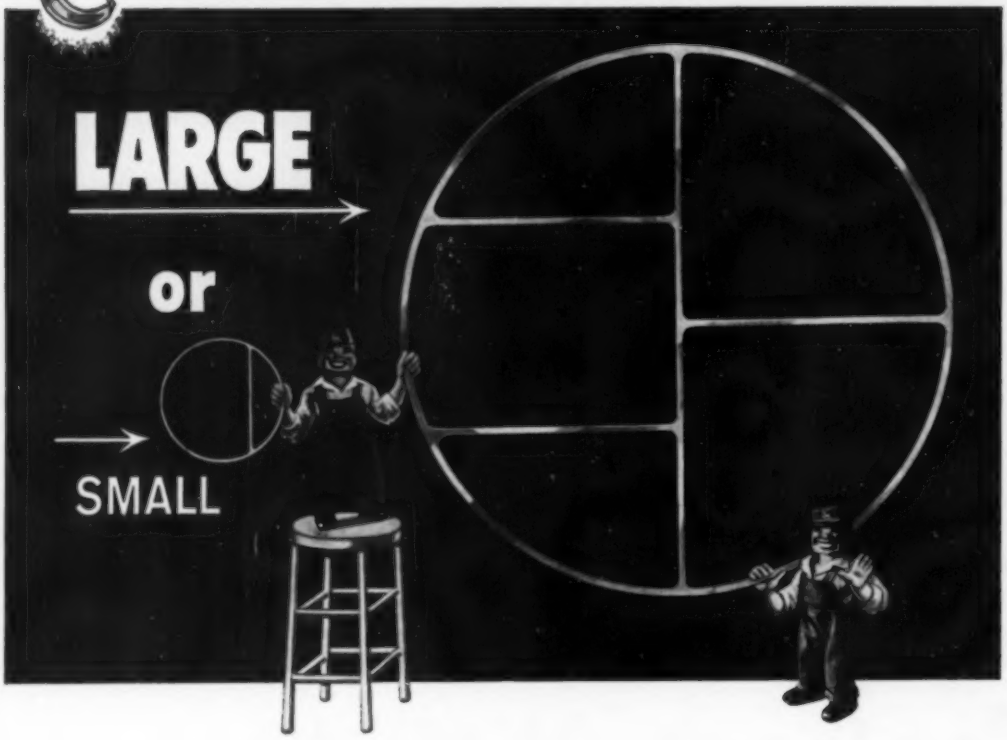
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Hand-tailored to any size you need...



...Goetze Heat Exchanger Gaskets are precision-made for longer service

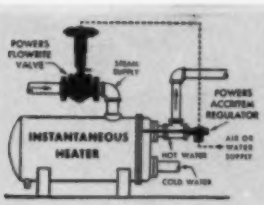
Whether your requirements call for heat exchanger gaskets larger than 100" in diameter, or smaller than 10", you can get the exact size you want... hand-tailored to the shape you need... simply by specifying "Johns-Manville Goetze."

And because they're *precision-made*, you'll find these better gaskets provide the effective sealing and longer life that make them actually cost less in the long run. Each gasket is carefully constructed in every detail to assure accuracy of fit ... to provide ample lap widths and uniform rib widths... and to prevent trouble-making wrinkles or cracks on the corners.

If you're having trouble with persistent joint leakage and frequent gasket replacements, find out how little it costs to have Goetze Heat Exchanger Gaskets tailored to your requirements. Your blueprint or template will bring a prompt estimate. Address Johns-Manville, Box 290, New York 16, New York.

Johns-Manville *Goetze* GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE

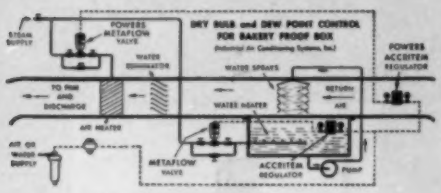


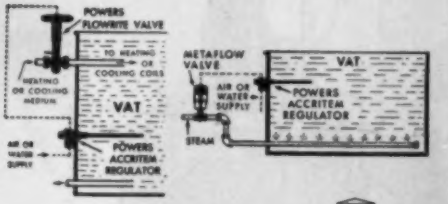
POWERS

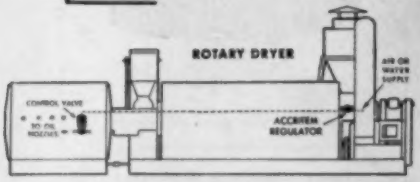
ACCRITEM REGULATOR



Only a few of many uses





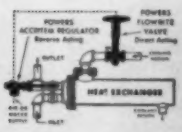


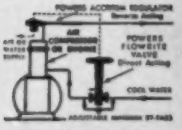
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Accurate, Low Cost Heat Control

Use Accritem Regulators to control diaphragm operated valves or dampers. They save labor, stop losses caused by over-heating and have the following—

IMPORTANT ADVANTAGES

- ***Adjustable Sensitivity*** and over-heat protection.
- ***Calibrated Dial*** temperature adjustment.
- ***Simple, Rugged Construction*** withstands vibration and insures many years of reliable service.
- ***Temperature Ranges*** 50 to 250° F. and 150 to 350° F.
- ***Easy to Install*** Requires 15 lb. supply of compressed air or water for its operation.
- ***Small Size***—regulator head is only 2⅞" x 3⅝", sensitive bulb is 12" long with ½" I.P.S. connection.

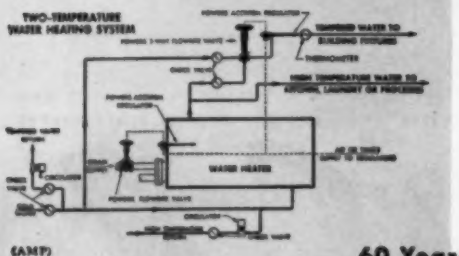






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FLOWRITE and METAFLOW
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provide an unbeatable combination for *better control* and *lower maintenance*

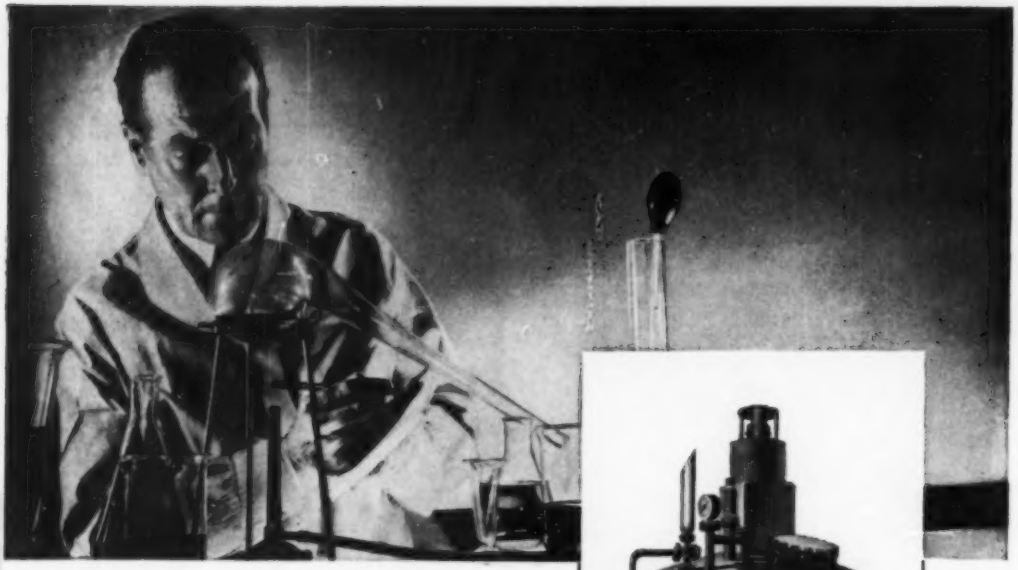


Write for Bulletin 316—or phone our nearest office for prices and further information about POWERS ACCRITEM regulators and diaphragm valves.

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CHICAGO 13, ILL., 3819 N. Ashland Ave. • NEW YORK 17, N.Y., 231 E. 46th St.
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MEXICO, D. F., Apartado 63 Bis.

(AMP)

60 Years of Temperature and Humidity Control



Pointer on Purity

...from an Acid Adjustment tank

Perhaps, as in many businesses these days, you're finding that peak throughput efficiency . . . product purity control . . . and close curbs on down-time have become slippery process plums to hold on to.

Chances are, the resourceful approach of a progressive equipment builder can help—the kind of builder that planned extra purity into these clad steel acid adjustment tanks, for example.

For, before a blueprint is drawn, builders like this apply *Lukenomics* . . . the principle of exploratory equipment planning. Through Lukenomics, they tap the extra experience of designer and engineer, as well as Lukens' own knowledge of materials, their production and use.

Whatever your processing picture, plan now for maximum yield from equipment and manpower dollars. For names of progressive builders who can help you, write today outlining your problems. Manager, Marketing Service, Lukens Steel Company, 400 Lukens Building, Coatesville, Pa.

SPEED SALE OF YOUR SCRAP

Fabricated by an equipment builder using the Lukenomics principle

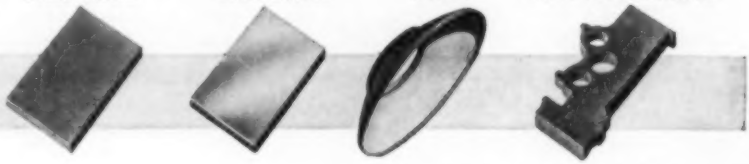
Here's a sample of Lukenomics coordination at work. For high purity in Chloromycetin—vital new antibiotic—acid adjustment tanks and fermentation units were built of Lukens Inconel-Clad Steel with specially polished interiors. *Bonus* results: low initial cost, minimum maintenance, special resistance to corrosion threats of salt and other chemicals. And—by use of *clad*—the builder also saved critical amounts of one of today's scarce metals.

LUKENS

LUKENS STEEL COMPANY

OVER 140 YEARS' EXPERIENCE AS THE WORLD'S LEADING PRODUCER OF SPECIALTY STEEL PRODUCTS

STEEL PLATE | CLAD STEELS | HEADS | STEEL PLATE SHAPES



Dependable temperature control to 1000 F



Connection between the instrument and its primary element (a Thermohm temperature detector) is wire . . . not tubing. Can be any length without affecting accuracy or dependability.



Typical samples of the information available on Electromax Control. Specify nature of process and whether fuel is gas, oil, steam or electricity.

ELECTROMAX Controllers give modern electronic regulation to thousands of important manufacturing processes. In any application up to 1000 F they exactly fill the bill for non-recording controllers of outstanding dependability.

Electromax has the sensitivity, accuracy and dependability of its big brother Speedomax Recording Controller. Likewise, it is not affected by vibration or building tremors . . . can even be mounted on the frame of a molding press. The instrument needs almost no attention, because it has only one moving part . . . a covered plug-in type relay. There's usually no need to open the instrument door for months at a time.

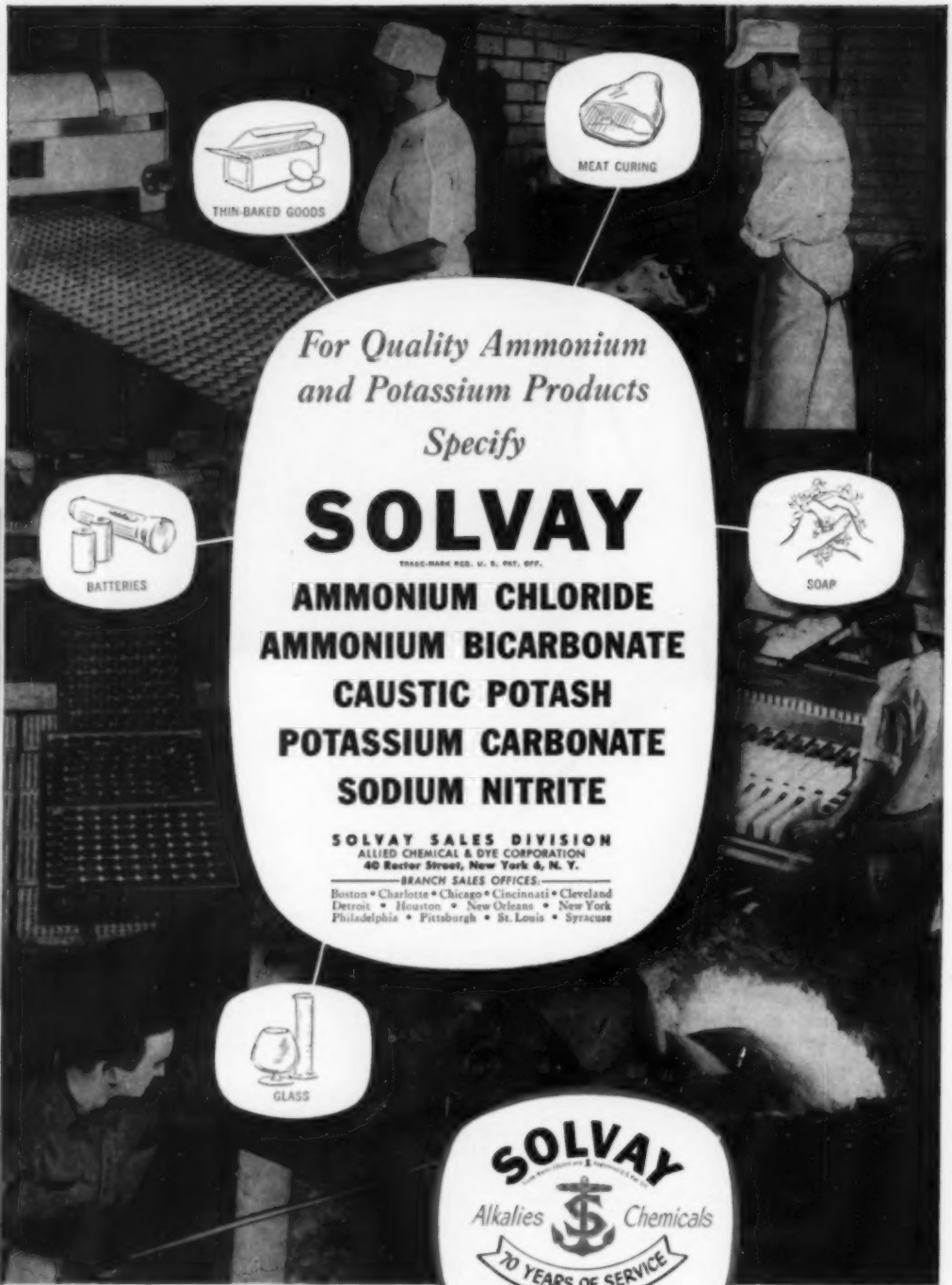
Electromax Control is available to provide any one of three control actions. For the more simple process requirements, on-off or two position control is usually used. For processes requiring control within unusually close limits, two different types of proportional control are available . . . Position-Adjusting Type and Duration-Adjusting Type. All three types of control action can be applied to electric, steam or fuel heating.

For further information, write our nearest office, or 4916 Stenton Ave., Phila. 44, Penna.

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

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For Quality Ammonium and Potassium Products

Specify

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AMMONIUM CHLORIDE
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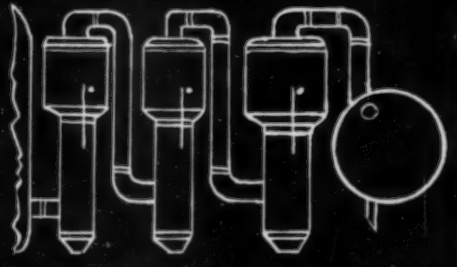
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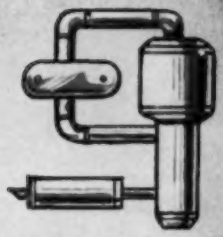
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Alkalies Chemicals
70 YEARS OF SERVICE
1881 1951

Soda Ash · Caustic Soda · Caustic Potash · Chlorine · Potassium Carbonate · Nytron
Calcium Chloride · Sodium Bicarbonate · Specialty Cleansers · Ammonium Bicarbonate
Sodium Nitrite · Para-dichlorobenzene · Ortho-dichlorobenzene · Monochlorobenzene
Methanol · Ammonium Chloride · Formaldehyde

The difference between Night and Day



Illustrated above is a triple effect plant, requiring a boiler, three evaporators, a condenser, 4 sets of controls, etc. . . 34 gallons evaporated per gallon of fuel.



Illustrated above is a thermocompression plant, requiring only one evaporator, a compressor, and a heat-exchanger . . . 300 gallons evaporated per gallon of fuel.

with MECO THERMOCOMPRESSION EVAPORATORS

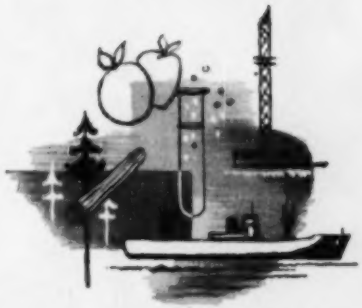
lower cost — much greater efficiency!

LOWER FUEL COST

No matter what the job is—evaporation for concentration or distilled water production—you will find that MECO thermocompresion evaporators do the job better at less cost! For instance, one MECO unit is equivalent in efficiency to a *27 effect*, multiple effect conventional plant . . . can make *pyrogen free*, chemically pure water.

LOWER OPERATION & MAINTENANCE COST

The higher the efficiency, the fewer the components, the more simple in principle the machine is—the less the cost of operation! Our brochure will describe principles of MECO thermocompression evaporation and the reasons why it will keep the operating cost of your job down, way down! MECO's working parts are so few and so easy to keep up that an average mechanic can do it with ease. High quality design insures long life.



Sea water for distillation for the oil industry . . . Concentration for the Chemical industry . . . uses in the paper, fruit juice and many other industries.

MECO

MECHANICAL EQUIPMENT CO., INC.

NEW ORLEANS, LOUISIANA

This equipment is built under various patents belonging to Mechanical Equipment Company, and Arthur D. Little, Inc.

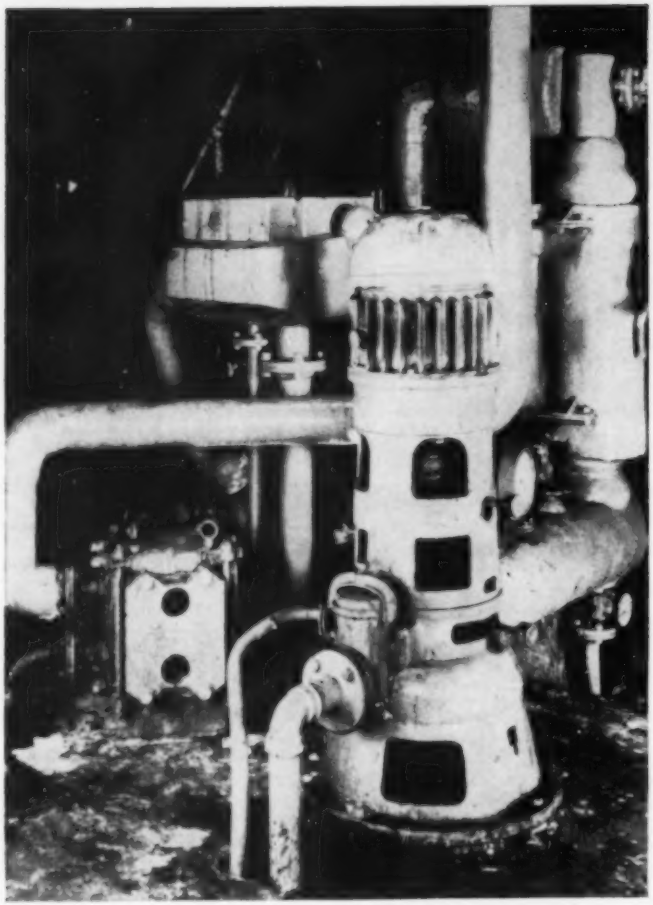
MECHANICAL EQUIPMENT CO., Inc.
861 Carondelet St.
New Orleans, La.

Please send me bulletin concerning MECO thermocompression evaporation units.

Name _____

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Pump doing a SPECIALTY ACT



Here's a LaBour Type G pump in a chemical plant near Birmingham, England, that hasn't had a day off since it was first put in operation more than two years ago. It's handling phosphoric acid on continuous duty, and the owners report "complete satisfaction."

You can be sure of complete satisfaction when you put your liquid-moving problems up to LaBour, because LaBour has been solving the tough ones for the chemical industry since the mid-twenties. Simplicity of design, coupled with the most rigid standards of manufacture and test, make LaBour pumps *dependable.*

True operating costs stay way down when you eliminate expensive service interruptions—and that's LaBour's specialty.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.

IN THE SUBTROPICAL HEAT of Port Arthur, Texas, the contents of these monster Hortonspheroids, at the Gulf Oil Corporation plant, must be kept at 50°F. These pictures show how rigid blocks of FOAMGLAS—the cellular glass insulation—provide close-fitting, continuous insulation on the multi-curved surfaces. Insulation Contractor: Thermal Products Company, Houston, Texas.



A FOAMGLAS "BLANKET" KEEPS THEM COOL

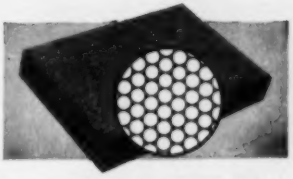
▶ It's the way it is made and what it is made of that give FOAMGLAS its long lasting insulating effectiveness.

The still air sealed in its cellular structure guarantees the insulating efficiency of FOAMGLAS. And the cells are glass, which has unusually high resistance to elements that destroy other insulating materials. So FOAMGLAS retains its *original* insulating properties for years on end, without costly maintenance, repairs or replacement.

These are the main reasons why so many users believe that FOAMGLAS is the most effective and economical insulation on the market . . . for tanks, towers and other large vessels . . . for piping, valves and fittings . . . for heat exchangers, evaporators and other processing equipment.

Want more detailed information? Just send in the coupon and we'll gladly send you a sample of FOAMGLAS and a free copy of our latest fact-filled booklet.

PITTSBURGH CORNING CORPORATION
Pittsburgh 22, Pa.



The bad glass insulation is cellular glass. The only cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, vermin-proof. It has unusually high resistance to moisture, chemicals and many other elements that cause insulation to deteriorate.

▶ Be sure to visit our exhibit at the 23rd Exposition of Chemical Industries, Grand Central Palace, New York, November 26—December 1, 1951, Booth No. 642.

PITTSBURGH PC CORNING

FOAMGLAS® *the cellular glass insulation*

When you insulate with FOAMGLAS — the insulation lasts!

Pittsburgh Corning Corporation
Dept. CC-121, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation, a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

Name.....

Address.....

City.....**State**.....



HERCULES CARBOY BOXES

GIVE YOU EXTRA PROTECTION!

PROMPT DELIVERY

You get extra protection from these rugged, all wood carboy boxes due to their sturdy, patented construction . . . with interchangeable cork (Hercules) or rubber cushion (Aero) inserts and cushions. That's why they stand up under the rough-and-tumble of regular usage and save you both time and money by reducing bottle breakage, repairs and replacements. For the best carboy boxes possible . . . contact National!

6½-GALLON CARBOY FEATURES

Built to withstand an internal pressure of 10 lbs. this completely enclosed wooden carboy, with interchangeable cork or rubber cushion inserts and cushions, complies with I.C.C. 1-D regulations for the transportation of mineral acids. Specific application should be made for other uses.



1. **Flat cover — no protruding neck—enables boxes to be piled on top of each other for convenient, compact storage.**
2. **Corner posts provide a convenient handle so that one man can handle the carboy.**
3. **Small size and light weight provides for easier handling and shipping.**
4. **Regulation Polystyrene cap supplied.**

Complies with classification I.C.C. 1-D



13-GALLON CARBOY FEATURES

1. **All-point protection reduces bottle breakage to a minimum—both in loading and transit.**
2. **Reduces occupational hazards since safety from breakage minimizes danger of acid burns or fire.**
3. **Eliminates foreign filler materials from container.**
4. **Easy to handle, through good grip on side hand braces.**
5. **Compact loading, resulting in space saving storage.**
6. **No skilled labor or special tools required. Any man can handle it quickly and efficiently.**
7. **Also available in 5 gallon and other capacities.**

Complies with classification I.C.C. 1-A

For Information write to Dept. E

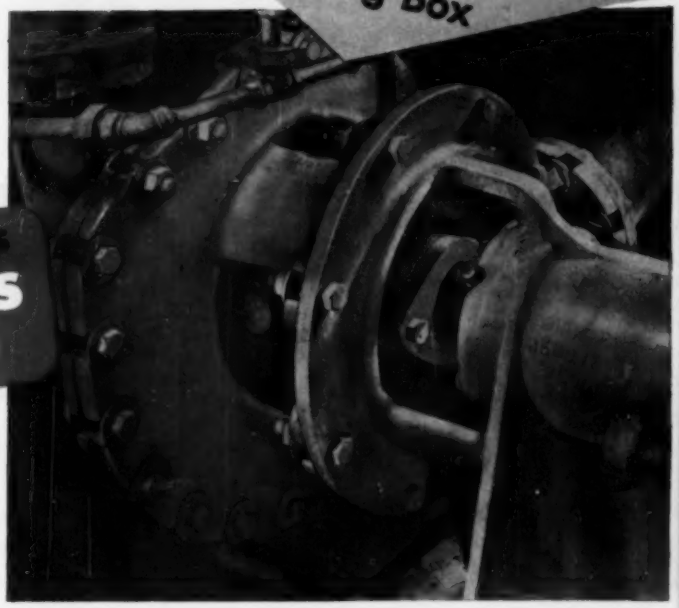
NATIONAL BOX & LUMBER COMPANY

NEWARK 5, NEW JERSEY

Stop PUMP LEAKAGE



Go from this to this with EQUISEAL Stuffing Box



ALLIS-CHALMERS
PROCESS PUMPS

YOU CAN STOP LEAKAGE entirely on suction heads up to fifteen feet with the Allis-Chalmers Process Pump equipped with *Equiseal* stuffing box. This new stuffing box is so effective that the packing may actually be removed while the pump is in operation and no leakage will occur even though there is direct passage from the liquid being pumped to atmosphere. Where suction head is more than fifteen feet, pressure on the packing is reduced by this amount and leakage is greatly reduced.

HOW IT WORKS

An auxiliary impeller develops a low pressure area in front of the packing. The liquid being pumped is thrown away from the stuffing box and back into the main stream. As a result, pressure on the packing is zero up to fifteen feet of suction head and the liquid being pumped does not even enter the stuffing box.

So if you must stop leakage because of sanitation, corrosion, abrasion or for any other reason, call your nearby Allis-Chalmers Authorized Dealer or District Office for application engineering help on your job. Or write Allis-Chalmers, Milwaukee 1, Wisconsin and ask for Bulletin 08B6615. A-3475

Equiseal, Vari-Pitch and Texrope are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Sold . . Applied . . Serviced . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — ½ to 25,000 hp and up. All types.



CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.



TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

These new fittings reduce piping costs by 10% to 40%



Speedline **aligning connector**

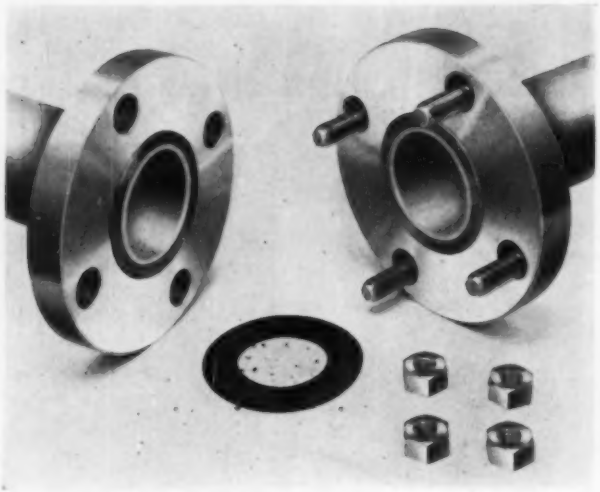
Joins pipe schedules 5, 10 and 40 and is also made for tubing.



Speedline **tube union**

Combines best features of screwed pipe and sanitary unions; eliminates leakage encountered with ground joint type fittings.





Speedline **insert flange**

Corrosion-resistant serrated insert in a carbon steel flange. Only tools needed for assembly are a standard expander and open end wrench.

• This is the first *complete* line of corrosion-resistant fittings for use with light-walled Schedule 5 pipe.

First cost of *Speedline* Fittings is less than you're used to paying for fittings. And your savings in costs for pipe, valves, etc. are tremendous. *Speedline* elbows, tees, reducers, etc. are specially designed to simplify installation. These fittings will also reduce installation time, saving you still more on your piping work.

The *Speedline* Fittings book gives you the complete story—savings combined with strong, safe process piping layouts. We'll be glad to send you a copy.

Speedline **Corrosion-Resistant FITTINGS**

—the newest thing in pipeline economy

HORACE T. POTTS CO. *Since 1815* Erie Avenue & D Street • Philadelphia 34, Pa.

POINTS TO CHECK ✓

IN YOUR COOLING TOWER INVESTMENT

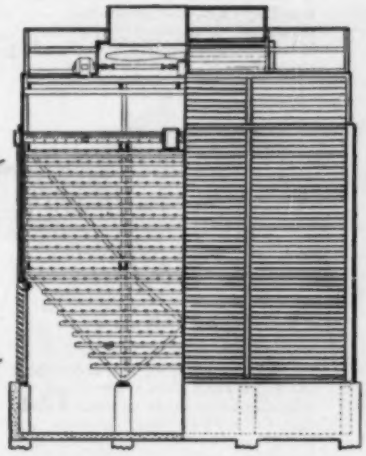
Here's what you get with a *C.H. Wheeler* Cooling Tower

GUARANTEED COOLING RESULTS—Names of installations near you sent on request. Repeat orders prove customer satisfaction. ✓

TWO TENTHS OF 1% DRIFT LOSS—Accurately placed Herringbone Drift Minimizers save on make-up water. ✓

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VACUUM REFRIGERATION—COOLING TOWERS—HIGH VACUUM PROCESS EQUIPMENT—MICRO-PARTICLE REDUCTION MILLS—STEAM CONDENSERS—STEAM JET EJECTORS—MARINE CONDENSERS & EJECTORS—DECK MACHINERY

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Buffalo, too, has a conveniently located American Blower Branch Office to provide you with data and equipment for air handling. You can reach American Blower in Buffalo by calling Washington 2668. In other cities, consult your phone book.



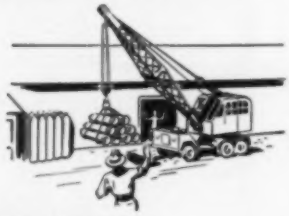
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Fine yarn filaments, strong plump fibers —these are the marks of a good textile mill. And, in many top mills, you'll find American Blower equipment helping in the control of inside temperature and humidity. For example, several of our large AHS Fans were ordered recently by an important Southern mill. The thing operators like about these fans is their non-overloading power characteristics and their remarkable efficiency over a wide range (which saves them money). May we help you with a similar problem?



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If you're concerned with power transmission, you'll want to know about our Gyrol Fluid Drives. Developed originally for use with mechanical draft fans, Gyrol Fluid Drives are today widely used in industry. They offer three important advantages—smoother acceleration, overload protection and substantial power savings. One company uses Fluid Drives on a crane that picks up acetylene tanks. Before they were installed, the tanks got such a violent swing from the quick start they would often damage building walls. Since using the Fluid Drives, they've had no trouble.

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American Blower heating, cooling, drying, air conditioning and air handling equipment can do much toward improving comfort and efficiency in business. For data, phone or write our nearest branch office.



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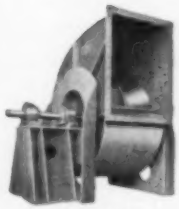
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Gyrol Fluid Drives



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Continuously removes solids from liquids . . . clarifies liquids . . . classifies solids.



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Separates two immiscible liquids containing solids . . . concentrates solids in a liquid phase. Continuous solids discharge.

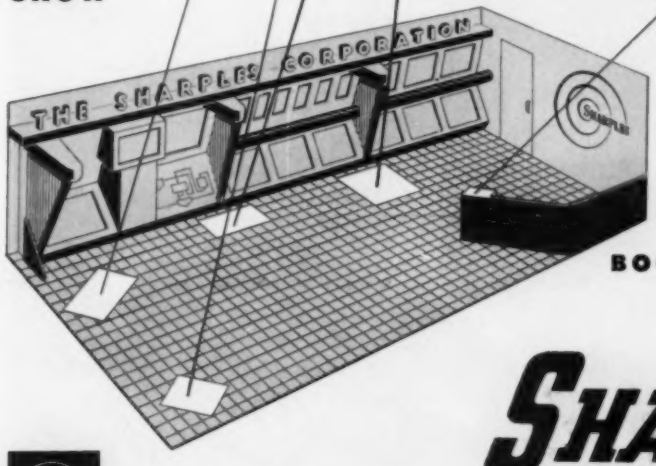


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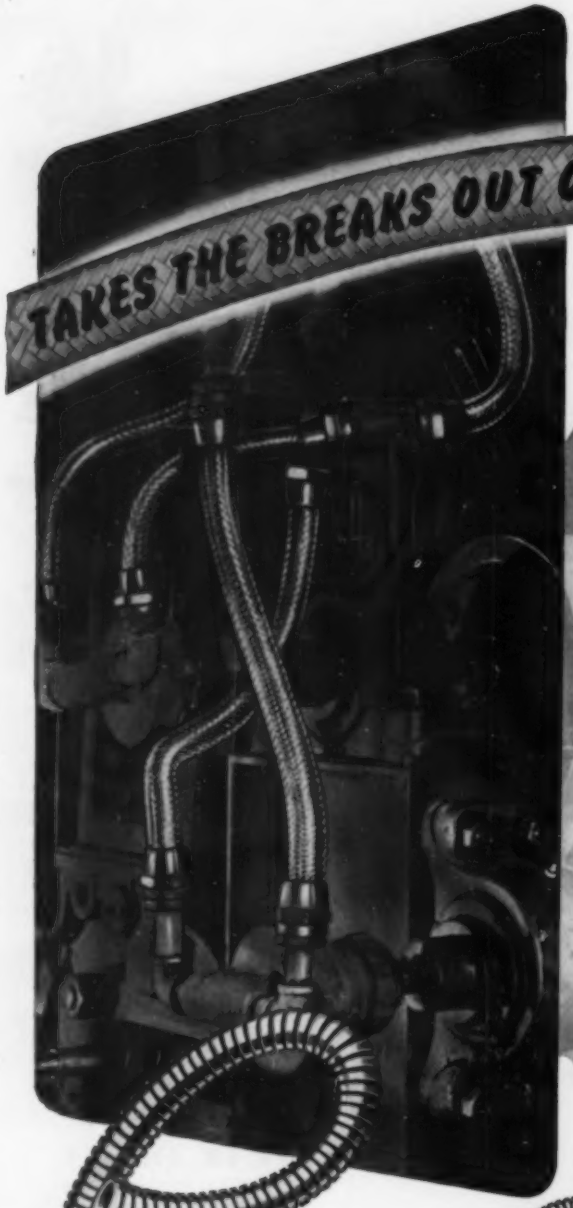


BOOTHS 58 AND 59

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The answer was one-half inch and three-quarter inch diameter braided Penflex-weld, equipped with Metseal couplings. This corrugated, all metal welded tubing serves the double purpose of giving flexibility and developing super-resistance against bursting, crushing or breaking. Non-burnable Penflexweld affords complete protection against high temperatures. Vibrating motion is isolated at its source.

Penflex engineers can help you solve flexible tubing application problems. In addition to corrugated welded tubing Penflex manufactures a complete line of four-wall, interlocked tubing from 1/8" I.D. and up . . . automatic barrel fillers, accessories and fittings. Write for the new Penflex catalog that gives the latest data on the application of flexible tubing for the greatest efficiency.

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NEW SINGLE BEAM SYSTEM IS SIMPLE, ACCURATE, RELIABLE

The Beckman Single Beam Direct Transmittancy Recorder employs the memory standardization principle, using reliable electronic circuits instead of complicated mechanical-optical arrangements. It successfully combines the highest accuracy with the utmost in reliability and convenience. A standardizing run is made on the empty or solvent-filled absorption cell. During this run the signal from the photoreceiver is automatically maintained constant, and the resulting slit width vs. wavelength function is "memorized" on a wire recorder. The sample is then placed in the same cell, and information played back from the wire recorder automatically controls the wavelength and slit drive motors to reproduce precisely the conditions which produced the constant 100% reference level. Any absorption resulting from the sample is accurately and automatically recorded directly in transmittancy. On repeat runs, the same reference wire is used, eliminating repetition of standardizing measurements.

Single beam transmittancy recording retains the excellent resolution, low stray light, high stability and drift freedom, and the wavelength accuracy of the well-known Beckman Spectrophotometers. Other advantages are summarized at the right.

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Beckman Single Beam Direct Transmittancy Recording is available either (1) as an accessory unit for direct installation on any Beckman IR-2 Spectrophotometer, or (2) with the IR-2 as a complete instrument, or (3) in the new unsurpassed Beckman IR-3 Spectrophotometer—the most versatile, most accurate, most complete—and by all standards, the *finest* spectrophotometer money can buy.* For further information on these instruments write . . .

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**As in all Beckman instruments, your money buys more value than in any similar product.*

IMPORTANT ADVANTAGES of the Beckman Transmittancy Recorder

- **GREATER CONVENIENCE:** The single-beam principle eliminates troublesome, time-wasting cell- and beam-matching problems.
- **GREATER VERSATILITY:** Greater versatility and simplicity and lower costs are assured, since special cells and attachments need not be duplicated for use in a reference beam.
- **GREATER ACCURACY:** The single-beam principle eliminates problems of making a beam attenuator achromatic, linear and free of vignetting effects.
- **MINIMUM STRAY LIGHT:** Only these single beam instruments use a filter-type beam chopper, reducing stray light effects to a minimum (less than 2% at 15 microns with the IR-2).
- **MINIMUM SCANNING TIME:** Optimum recording efficiency is achieved because each spectral slit width is traversed in a time proportional to the response period of the recording system. Any other scanning rate loses either resolution, time or accuracy.
- **MAXIMUM RESOLUTION:** Slit width control has the advantage that the instrument is always working at maximum resolution for the chosen amplification and scanning speed.
- **FLEXIBILITY OF CONTROL:** Operating speed, resolution and chart scales can be easily varied over wide ranges. A single control adjusts scanning time per spectral slit width from 1 second to 128 seconds by factors of 2. The wavelength motor speed is electronically controlled with no gear shifting needed to change scanning speed.

In addition to recording linearly in wavelength, a unique electronic system enables recordings to be made linearly in other functions such as frequency or log wavelength.



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***for** every fluid heating service, capacity or duty, irrespective of temperature pressure range.*



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for RECYCLING PLANTS



catalysis heaters with catalyst in tubes, steam superheating to 1500°F, gas cracking, reactant distillation, direct fired reboiling

for CHEMICAL PLANTS



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for GAS PLANTS



at individual leases and for main line dehydration for catalyst regeneration—up to 500,000,000 cubic feet per day, unlimited pressure

for PIPELINES



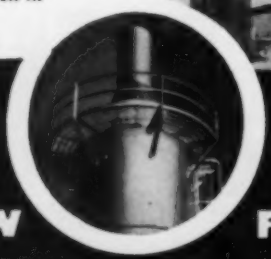
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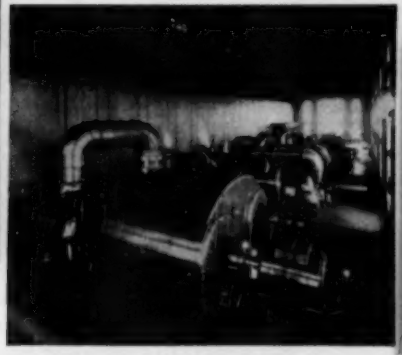
So dependable,

he didn't even know a Lectrodryer was on the job





This little Lectrodryer and Lectrofilter DRY and CLEAN the hydrogen that cools these giant generators ⟶



A power plant engineer, harrassed by faulty functioning of controls, was buying a drier for his instrument air lines. "How dependable are Lectrodryers?" brought this astonishing reply. "We've had one drying hydrogen for years. Didn't you know it was there?"

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De Laval centrifugals for chemical processes have three basic applications: (1) continuous separation of two liquids, (2) continuous clarification of one or two liquids, and (3) continuous separation of two liquids plus the continuous removal of solids from one or both.

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SEPARATION · CLARIFICATION · CONCENTRATION



Follow through

"To get distance," an old pro once told us, "you've got to follow through."

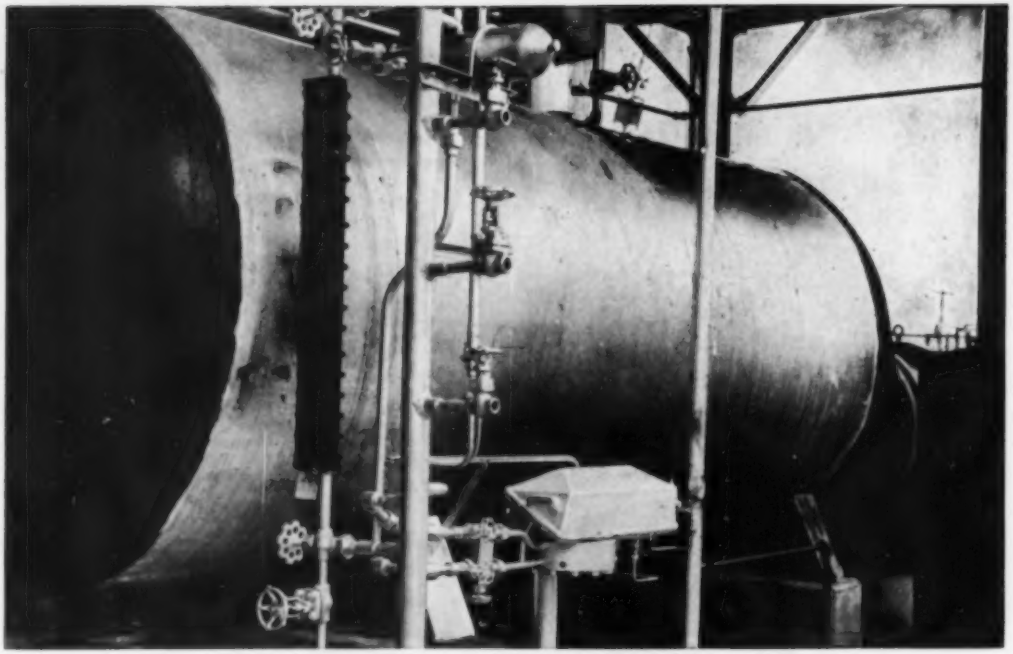
We think that makes good sense in business, too. So we're not content just serving our customers' day-to-day needs. Our Market Research Department, for instance, looks ahead . . . studies their growing needs . . . and we expand to meet them.

That's why we can take care of our customers of record with soda ash in times of long or short supply.

We'd like to plan on establishing you as a customer of record. Why not follow through with an inquiry *now* — and find out the long-range advantages of dealing with a reliable source of supply?

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Republic Transmitter measuring level in reboiler

DIFFERENT . . . in design and performance

The Republic Pneumatic Transmitter is a device for converting process variables, such as flow, level, pressure or liquid density, into air pressures. These air pressures are a direct measure of the process variables or can be used as the measuring impulse for the actuation of an automatic controller.

The force-balance method of measurement, as employed by the Republic Pneumatic Transmitter, offers many inherent advantages such as:

AMBIENT TEMPERATURE — The effect of ambient temperature variations on the accuracy of a Republic Transmitter is negligible. Since all parts are equally affected by temperature changes, force and leverage relationships are not disturbed and accuracy is unimpaired.

AIR SUPPLY PRESSURE — The effects of changes in air supply pressure is so small that it is guaranteed negligible.

LINE PRESSURE — The effect of variations in line pressure has been completely eliminated.

SENSITIVITY — Due to the negligible motions required for complete operation of all parts for full scale changes, no appreciable hysteresis results from reversal of direction of measurement change. The hysteresis loop is so small that it is undetectable by ordinary means, being less than 1/20 of 1%.

ACCURACY — The accuracy of the Republic force-balance method of measurement is higher than can be consistently secured and maintained with any other method. Transmitting pressure vs. measured force is guaranteed within ½ of 1% of meter range.

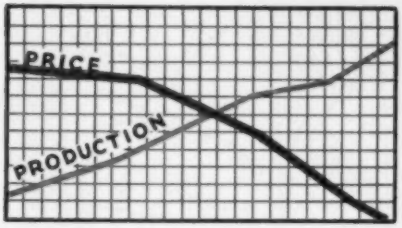
In addition to these five important features, the Republic Pneumatic Transmitter is extremely flexible in application, easy to service and of rugged construction.

If you have a flow, level, pressure or liquid density metering or control problem may we suggest that you investigate the Republic Pneumatic Transmitter? Data Book No. 1002, which contains complete details of this instrument, will be mailed to you upon request. Write for it today!

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Butylene Glycols



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2 Celanese 1,3 Butylene Glycol is a high boiling, low volatility, low toxicity solvent with hygroscopic properties which make it interesting to the tobacco, cosmetic and related fields as a replacement for or to complement other glycols and glycerine. It is also used for phthalic, maleic and fumaric alkyd resins and polyesters for plasticizers, coatings and laminates and as a solvent for steamset inks.

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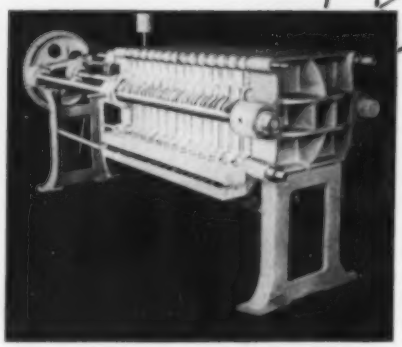
4 Butylene Glycol is being produced in dependable, high volume that assures you continuity of supply and a steady price structure. Write for Bulletins N-26 (1,3 Butanediol) and N-27 (2,3 Butanediol). Celanese Corporation of America, Chemical Division, Dept. 503-K, 180 Madison Avenue, New York 16.

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IDEA-PLASTICS

. . . from Du Pont Polychemicals Department

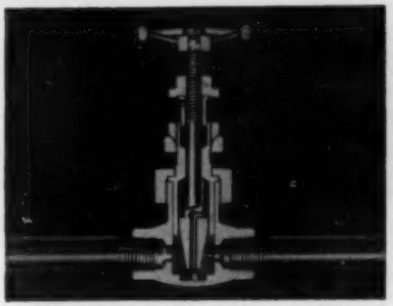
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in valve parts gives long life, outstanding performance

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"Teflon" is ideal for valve seats . . . and packing, too. It resists the attack of all chemicals except molten alkali metals, and fluorine under extreme conditions. It's remarkably tough, yet resilient enough to provide tight, leak-proof seating. In addition, "Teflon" has a service range in temperature, as proved in field applications from -320° F. to 500° F. And, when used in packing, its low coefficient of friction lets valves operate easily under pressure . . . without lubrication in most cases.

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for example, insulation for wires and cables, connectors for coaxial cables and jaws for heat-sealing machines. And they suggest many new applications wherever a heavy-duty plastic is practical.

Your business may find opportunities for profitable future use in "Teflon" or in many of the other Polychemicals products. There are more than 100 of them—plastics, organic acids, amides, alcohols, ammonia, esters, resins and solvents.

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Technical bulletins on "Teflon" tetrafluoroethylene resin and the plastics and chemicals used in your industry are available. Each product bulletin in the booklet presents physical and chemical properties, description, specifications, uses and possible applications, bibliography and other data. Write us on your business letterhead for your copy—and please tell us the name of your industry.

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excel for SAFETY wherever HAZARDOUS CONDITIONS EXIST



POWERSTAT
TYPE 1126



EXPLOSION-PROOF
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EXPLOSION-PROOF means that the POWERSTAT is enclosed in a rugged cast iron housing to withstand internal gas or vapor explosions and prevent ignition of gas vapors surrounding the enclosure. Approved by Underwriters' Laboratories for Class 1, Group D service.

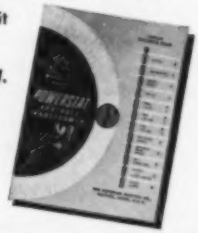
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An Offer of Research Facilities to Inventive Americans Who Need Them

The Sinclair Plan is opening up the Company's great laboratories to every American who has an idea for a better petroleum product

INVENTIVE Americans are often at a loss today. Not because of any lack of ideas, but because of a need for expensive facilities to find out if and how their ideas work.

This was no obstacle in our earlier days. The Wright Brothers designed their first airplane with the help of a foot-square homemade "wind box"—and the plane flew.

In contrast, the man with a new idea in airplane design today often needs a supersonic wind tunnel costing millions.

In short, science and invention have become so complex that a man with an idea for a better product often needs the assistance of an army of specialists and millions worth of equipment to prove his idea has value.

Within the petroleum field, the Sinclair Plan now offers to provide that assistance.

Under this Plan, Sinclair is opening up its great research laboratories at Harvey, Illinois, to independent inventors who have sufficiently good ideas for better petroleum products or for new applications of petroleum products.

If you have an idea of this kind, you are invited to submit it to the Sinclair Research Laboratories, with the provision that each idea must first be protected, in your own interest, by a patent application, or a patent.

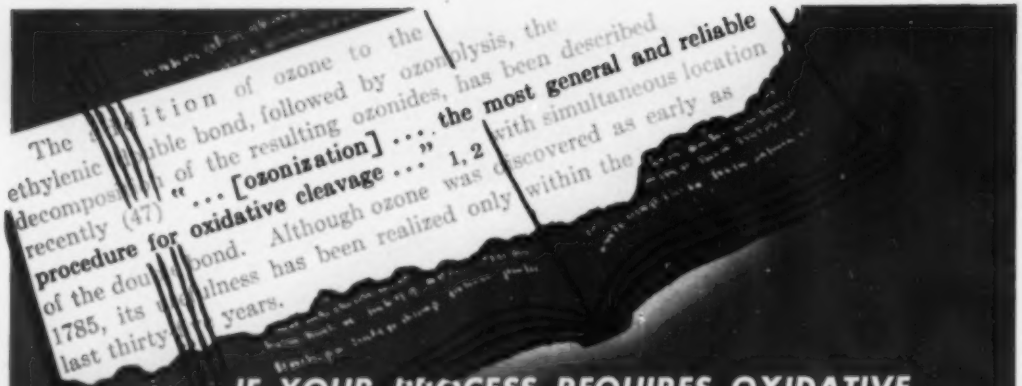
The inventor's idea remains his own property

If the directors of the laboratories select your idea for development, they will make, in most cases, a very simple arrangement with you: In return for the laboratories' investment of time, facilities, money and personnel, Sinclair will receive the privilege of using the idea for its own companies, free from royalties. This in no way hinders the inventor from selling his idea to any of the hundreds of other oil companies for whatever he can get. Under the Plan, Sinclair has *no control* over the inventor's sale of his idea to others, and has *no participation* in any of the inventor's profits through such dealings. Moreover, it is a competitive characteristic of the oil business that the new products adopted by one company are almost invariably adopted by the whole industry. This means that the very fact of his agreement with Sinclair should open up to the inventor commercial opportunities which might otherwise be hard to find.

How to proceed: Instructions on how to submit ideas under the Sinclair Plan are contained in an Inventor's Booklet available on request. Write to: W. M. Flowers, Executive Vice-President, Sinclair Research Laboratories, Inc., 630 Fifth Avenue, New York 20, N. Y. for your copy.

IMPORTANT: *Please do not send in any ideas until you have sent for and received the instructions.*

SINCLAIR—A Great Name in Oil



IF YOUR PROCESS REQUIRES OXIDATIVE CLEAVAGE, WELSBACH OZONE OFFERS INCREASED PROFITS ... because ...

1. The Ozonization Reaction, Louis Long, Jr. Chem. Reviews, 27:437 (1940)
2. Gilman, H.: Organic Chemistry, Vol. I, p. 547, John Wiley & Sons, Inc., New York (1938)

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These towering refineries mean light, heat, comfort and power for the nation's homes and industries . . . fuel for transportation by ship, rail and motor car . . . mobility for our naval and military forces.

They must not fail . . . *they will not fail!* Into their making have gone Sun's engineering skill and craftsmanship, time-tested in wide fields of mechanical production . . . in refinery and chemical plant equipment, in shipbuilding, in fabricated steel work, in the renowned and powerful Sun-Doxford marine Diesel engines and other specialized machinery.

The more exacting the specification, the greater opportunity for Sun to maintain its engineering prestige.

Sun

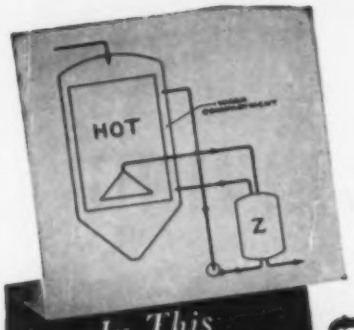
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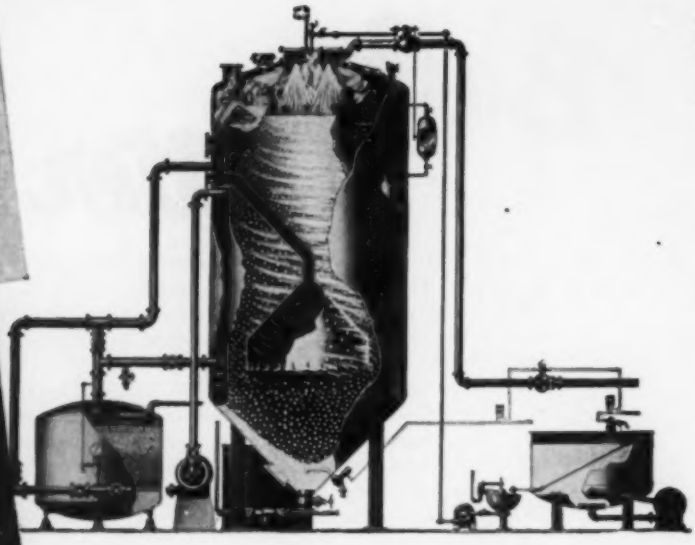
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In This
WORTHINGTON
HOT-Z
Deaerating Type Water Conditioning System . . .



Built-In Annular Wash Water Compartment Supplies and Reclaims Backwash Water

Independent of the Softening Process

No other Hot Zeolite System offers you so many advantages as this Worthington Hot-Z System. A quick review of the vital facts will show you why.

As you probably know, Hot Zeolite beds require periodic expansion to minimize packing and friction loss, and to insure efficient contact of each Zeolite particle with its share of dissolved impurities. This need for bed expansion occurs not only during the regeneration routine, but also several times during the period between regeneration routines. That's why it is important for you to use clean, softened water, preferably at normal operating temperature, for the reverse flow or "backwash" operation.

Worthington does it!

The Worthington Standard Hot-Z System with its backwash feature provides a built-in annular wash water compartment that supplies and reclaims backwash water . . independent of the system's softening process. In this compartment, backwash water is cleaned and maintained at normal operating temperature.

This backwash feature pays off particularly in systems employing filters because it *makes filter beds last as long as eight years.*

Other advantages

Worthington Hot Process Systems come equipped with modern, direct contact vent condensers. This means, no more of the scaling trouble that made the old-fashioned shell and tube types such a nuisance.

In addition, Worthington Hot-Z Systems operate on low-priced lime and salt. That's why the average installation saves enough in chemical costs to pay for itself in 3 years.

Get all the facts!

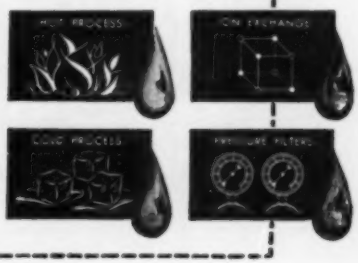
It will pay you to investigate the Worthington Hot-Z System thoroughly. Tell us your conditions of service and get our recommendation in terms of dollars and benefits. You'll find in our Hot-Z System, as in so much other equipment, *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Water Treating Section, Dunellen, N. J.*

B-1

WORTHINGTON

WATER CONDITIONING

Worthington Makes More of the Equipment for All Types of Water Conditioning Systems



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Chemical plant at Memphis, Tenn., uses 50' x 100' x 14' Butler Building with modified center section.



This Butler Building is one of 12 used by chemical company at Military, Kans. Installation provides warehousing for 15,000 tons of sacked ammonium nitrate fertilizer.

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The New Permutit DUAL BED ION EXCHANGER



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The Dual Bed Ion Exchanger employs new type resins that are regenerated with plain salt. For further details, write to The Permutit Company, Dept. CE11, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada Ltd., 6975 Jeanne Mance Street, Montreal.

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So says The Globe Company, manufacturer of meat processing machinery. "*In the packing industry where animal acids and moisture quickly destroy anti-friction bearings lubricated with conventional lubricants, LUBRIPLATE prolongs the life of bearings from 2 weeks to 2 years.*"

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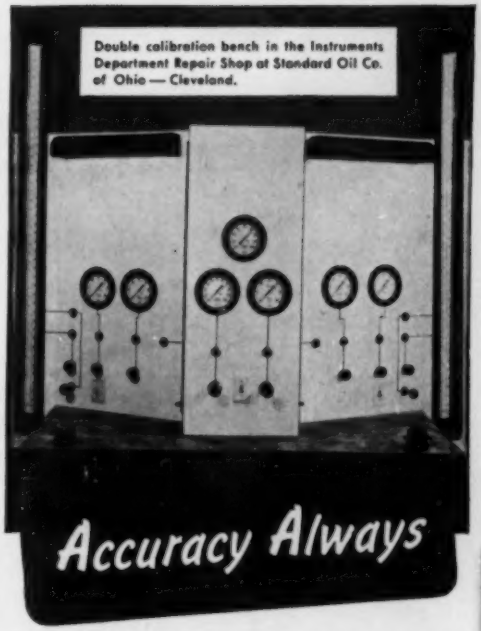


•DeZurick Easy-Operating Plug Valves are going into plant after plant because they don't leak . . . their exclusive rubber-faced plugs do a leakproof, drip-free job in any service from gas to acid to slurries.

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The Meriam Dual Tube Model M-100 Manometers permit quick, easy reading up to 200" water pressure. These instruments consist of two separate manometer tubes in the same case — each tube with individual well. The left tube has a scale increasing upward; the right tube a scale increasing downward. Both tubes measure the same pressure and permit the operator to read the manometer tube at the most convenient eye level.

For many years at Sohio, as well as at other oil, chemical, and processing companies, Meriam Manometers have proved thoroughly satisfactory for their specific applications. For further information on this Dual Tube Manometer development ask for Catalog Sheet M-100.

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MERIAM Instruments
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MANOMETERS, METERS AND GAUGES FOR THE ACCURATE MEASUREMENT OF PRESSURES, VACUUMS AND FLOWS OF LIQUIDS AND GASES

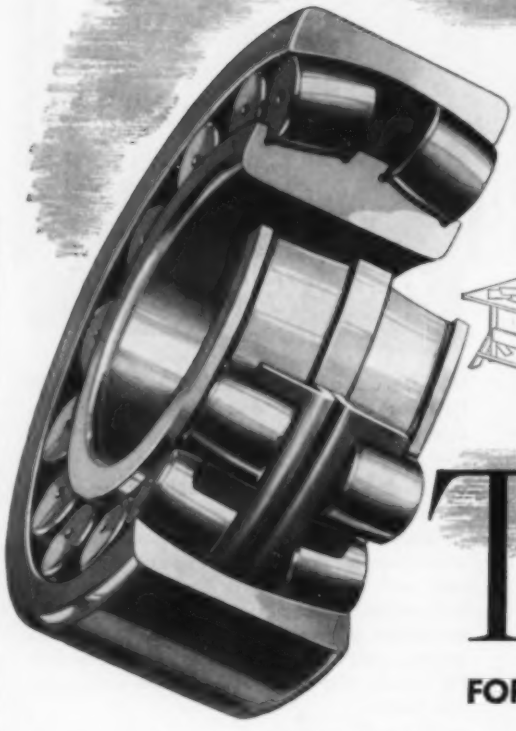




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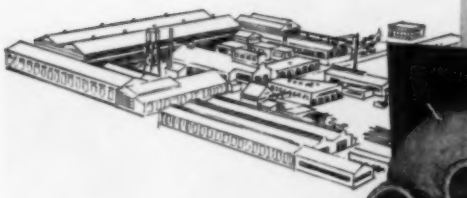
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the design that's going places





FATTY ACID DISTILLATION

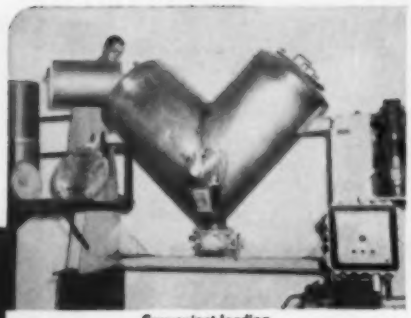
These stills have been fabricated along with other process components at the Carteret, N. J. shops of Foster Wheeler for export to Montevideo, Uruguay and Santos, Brazil where plants for the distillation of fatty acids are being erected by the company.

Both plants are based on a design which proved highly effective in connection with other Foster Wheeler installations now producing upwards of 150,000,000 pounds of fatty acids per year.

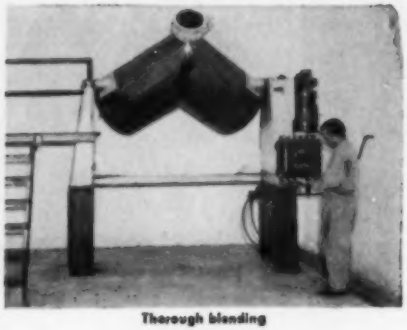
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FOSTER WHEELER

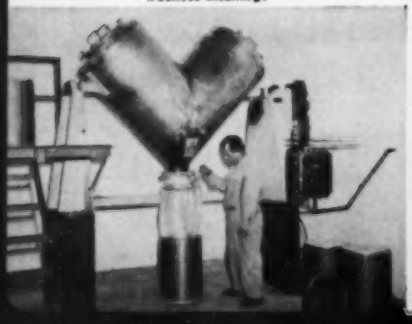


Convenient loading



Thorough blending

Dustless discharge



Easy cleaning



SAVES TIME PROMOTES UNIFORMITY for GANE'S chemicals



When executives of Gane's Chemical Works, Inc., Carlstadt, N. J., witnessed a laboratory test of the **p-k** Twin Shell Dry Blender, they were immediately impressed by its possibilities. Now—a 20-cu. ft. stainless steel blender is in constant operation, blending phenobarbital and similar drugs where no variation in lot batches can be tolerated. The **p-k** Twin Shell requires an average of only 10 to 15 minutes for a complete blend to absolute uniformity as compared with from 4 to 5 hours previously required in other blending equipment, without guarantee of uniformity.

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p-k will be glad to run an experimental blend of your materials to demonstrate timing for thorough blending. There is no obligation—and the results will introduce you to an entirely new and widely accepted method of dry blending.

Send for Catalogs 401 and 402 for further information on both the laboratory and production models.

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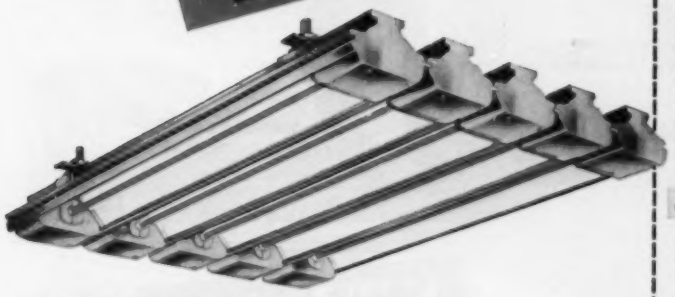
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for

variable heat

non-breakable infrared

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Get all the advantages of infrared heat and more—at a fraction of former costs with the new and improved CHROMALOX heating principle. All-metal construction, high heat intensity, infrared radiation that's "color blind" and heat that's infinitely variable, have proved CHROMALOX Radiant Heaters superior for over 300 different uses in more than 1500 plants. If you use heat for baking, drying, preheating, curing, degreasing and similar applications, CHROMALOX Radiant Heaters can very likely give more satisfactory results. See for yourself how these infrared units up output, improve uniformity, reduce costs.

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Electric Heat for Modern Industry

Time, money and material saving applications

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- ☐ Preheating strips
- ☐ Preheating cloth
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- ☐ Post-forming
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- ☐ Degreasing
- ☐ Paint baking
- ☐ Drying piston rings
- ☐ Baking wrinkle paint
- ☐ Welding preheating
- ☐ Drying automotive parts
- ☐ Preheating steel rolls
- ☐ Dehydrating refrigeration coils

GLASS

- ☐ Drying bottles
- ☐ Heating safety glass
- ☐ Setting dye on glass cloth
- ☐ Preheating lenses
- ☐ Drying mirrors

ELECTRICAL

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- ☐ Drying marine equipment
- ☐ Sealing headlights and television tubes
- ☐ Drying varnished wire
- ☐ Drying carbon resistors
- ☐ Drying color coding

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- ☐ Drying sand cores
- ☐ Skin drying of molds
- ☐ Comfort heating

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- ☐ Warming
- ☐ Drying baking pans
- ☐ Dehydrating crackers
- ☐ Baking biscuits
- ☐ Dehydrating coconuts

TEXTILES

- ☐ Dehydrating braided material
- ☐ Drying Nylon thread
- ☐ Dehydrating woolen cloth
- ☐ Setting flock

RUBBER

- ☐ Curing
- ☐ Heating rubber glue
- ☐ Curing latex

PRINTING

- ☐ Ink drying
- ☐ Static elimination
- ☐ Glue drying
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- ☐ Drying glaze
- ☐ Drying pottery

MISCELLANEOUS

- ☐ Sealing storage batteries
- ☐ Setting adhesives and cements
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- ☐ Send me application file on uses I have listed.
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- ☐ Send Chromalox Catalog on Industrial Heaters.

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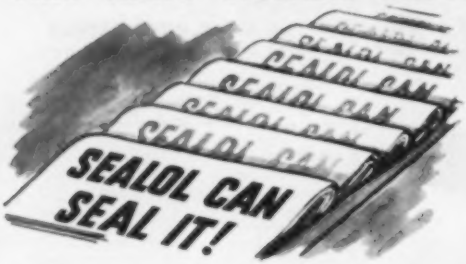
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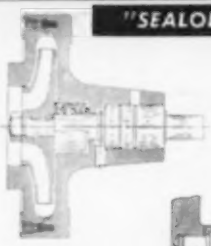
State_____ IC-61

THIS NEWS TRAVELS FAST!

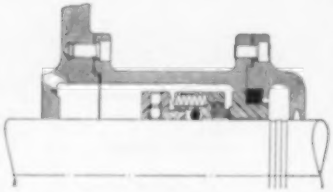


Where there's the WILL, "Sealol" is the WAY to get better sealing of rotary shafts. This balanced pressure mechanical shaft seal has proven itself in countless applications, handling the widest range of fluids, temperatures, pressures, and shaft speeds.

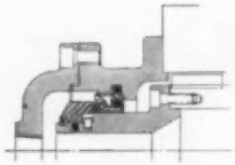
HERE ARE A FEW RECENT "SEALOL" APPLICATIONS:



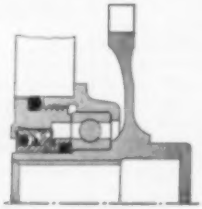
"SEALOL"
FCB Water Pump Seal (water 55 PSI, 3400RPM)



"SEALOL"
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Seal for Fluid Transfer (cutting oil 700 PSI, 3000 RPM)



"SEALOL"
Seal for Power Take-Off . . . Gas Turbine Engine (oil mist 5 PSI, 6000 RPM)

If you have a sealing problem, chances are "SEALOL" CAN SEAL IT! Write for engineering recommendations. Sealol Corporation, 45 Willard Ave., Providence 5, R. I.

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A complete steam plant backed by undivided responsibility • Shipped completely assembled • More than 80% thermal efficiency guaranteed • 4-pass design provides 5 sq. ft. of heating surface per b.h.p. • Built-in induced draft eliminates need of expensive chimney • Simple installation • Clean, quiet operation • Heavy-duty construction assures long-lived dependability

Superior Steam Generators are manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water heating.

For complete details, write for Catalog 322

SUPERIOR COMBUSTION INDUSTRIES, Inc.
Factory: Emmaus, Pa.
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SUPERIOR STEAM GENERATORS

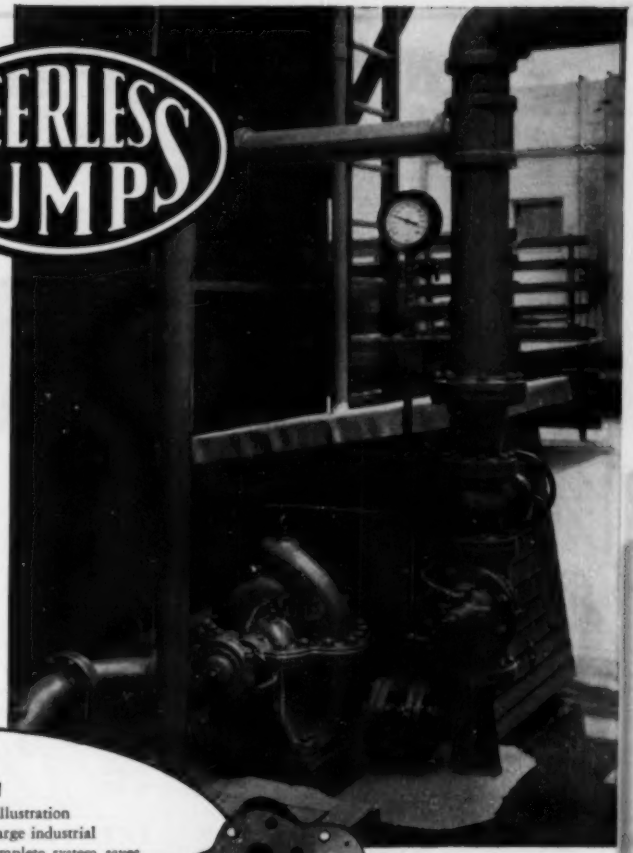
PEERLESS Type TU

PEERLESS PUMPS

MULTI-STAGE PUMPS for HOT and COLD LIQUIDS

A PLUS in Performance without a premium in price

When moderate capacities and high heads are involved in handling cooling tower water, boiler feed applications, and process liquids, Peerless Type TU pumps will exactly meet your needs. They provide capacities from 50 to 2,500 gpm, head ranges from 250 to 1600 feet and discharge sizes up to 10 inches. The low loop cross-over is cast integral with the top half of the pump case in sizes 4 inches and smaller. Excellent efficiencies and a great number of superior design features that effect long life with minimum downtime provide a performance plus at no extra cost.



MAKING RECORDS!

The Peerless Type TU pump in the illustration operates on a cooling tower system for a large industrial plant. According to their engineers, this complete system saves them over $550.00 every month, as against the previous method of using water from city mains, and discharging into the sewers after one use.

DEPENDABLE, DURABLE AND RUGGED DESIGN AND CONSTRUCTION . . .

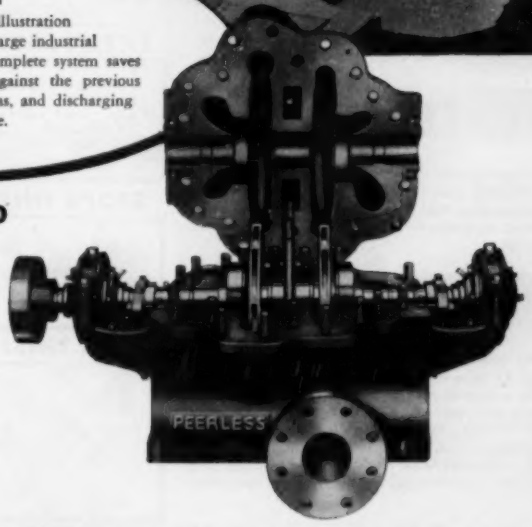
Here are a few features of Type TU construction:

Equipped with duplex angular contact thrust bearings, water cooled bearing housings, heavy stiff case rings, sleeves locked against impeller hubs, in-and-out cooling and sealing connections at stuffing box.

High pressure stuffing box on these pumps is under one stage pressure only, regardless of the net pressure developed by the pump.

Spacer bushings between stages are serrated with grooves throughout its length, are longer than competitive pumps, thus making an effective seal between stage pressures.

The Peerless Type TU pump is described in Bulletin B-301. Write for your copy today.



PEERLESS PUMP

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PEERLESS PUMP DIVISION

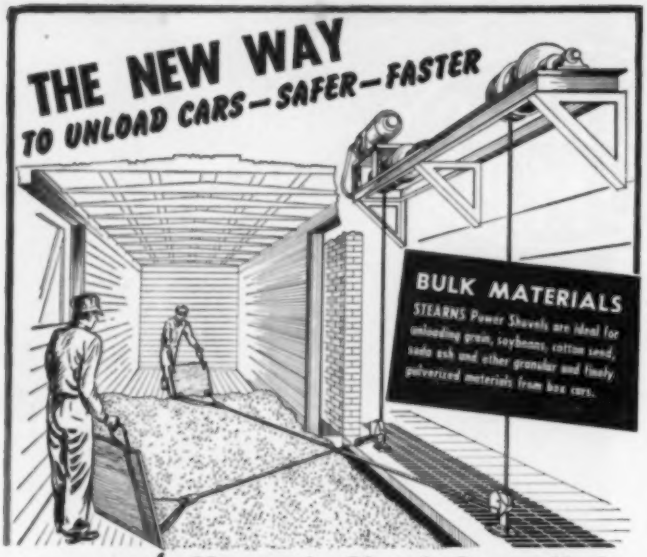
FOOD MACHINERY AND CHEMICAL CORPORATION

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THE NEW WAY
TO UNLOAD CARS—SAFER—FASTER



Stearns Magnetic Clutch Controlled
POWER SHOVELS

PATENT PENDING

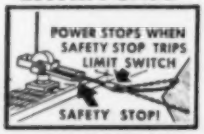
SAVES MEN

Using the STEARNS Power Shovel means safer unloading, for the moment the operator releases his pressure on the "dead-man" switch, the scoop stops! Thus injuries resulting from the operator being thrown over the board are eliminated. If the operator's leg is caught in a loop of the cable, serious consequence is avoided as the scoop automatically stops when the safety stop trips the limit switch.

SAFE



EXTRA SAFE



SAVES TIME

Cars can be unloaded faster with a STEARNS Power Shovel, for the operator does not have to wait for slack cable to be overhauled on short strokes. The scoop can be started or stopped anywhere — less time is spent in cleaning up the car.

STOPS THIS!



SAVES MONEY

With the control in the hands of the operator, unloading time can be cut up to 30%. This means lower direct labor costs for unloading each car and that more cars can be unloaded each day. As the man in the car completely controls the scoop, labor costs are further reduced — no man is needed outside the car to manipulate weights. Learn how STEARNS Power Shovels can save you men, time and money — write today for specifications and prices.

AND THIS!



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✻ Compare the Safety Stem Lubricator of this valve with that of any other wide band proportional type. Look at it closely . . . study it feature by feature.

Then check the other features of the valve . . . the Specially Designed Diaphragm, the Duplex Stem Guide, the One-Piece Bonnet, the Packless Bellows Seal, the wide variety of discs, the easy reversibility in the field.

Your comparison will prove that the Honeywell Series 700 has *all* of the features you look for in a fine valve.

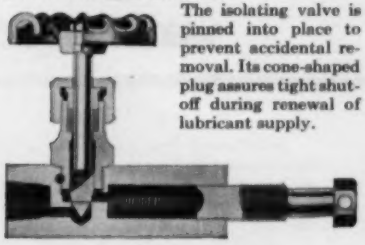
It's available in a wide range of styles and sizes. For detailed information, write for a copy of Bulletin 700-2, or call in your local Honeywell engineer . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

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The isolating valve is pinned into place to prevent accidental removal. Its cone-shaped plug assures tight shut-off during renewal of lubricant supply.



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Valve Products

pennsylvania company solves TOUGH water hose problems

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Could the problems be solved?

Republic's local Distributor thought so, and suggested a test run with Republic's Fairway Water Hose... no custom-built hose necessary.

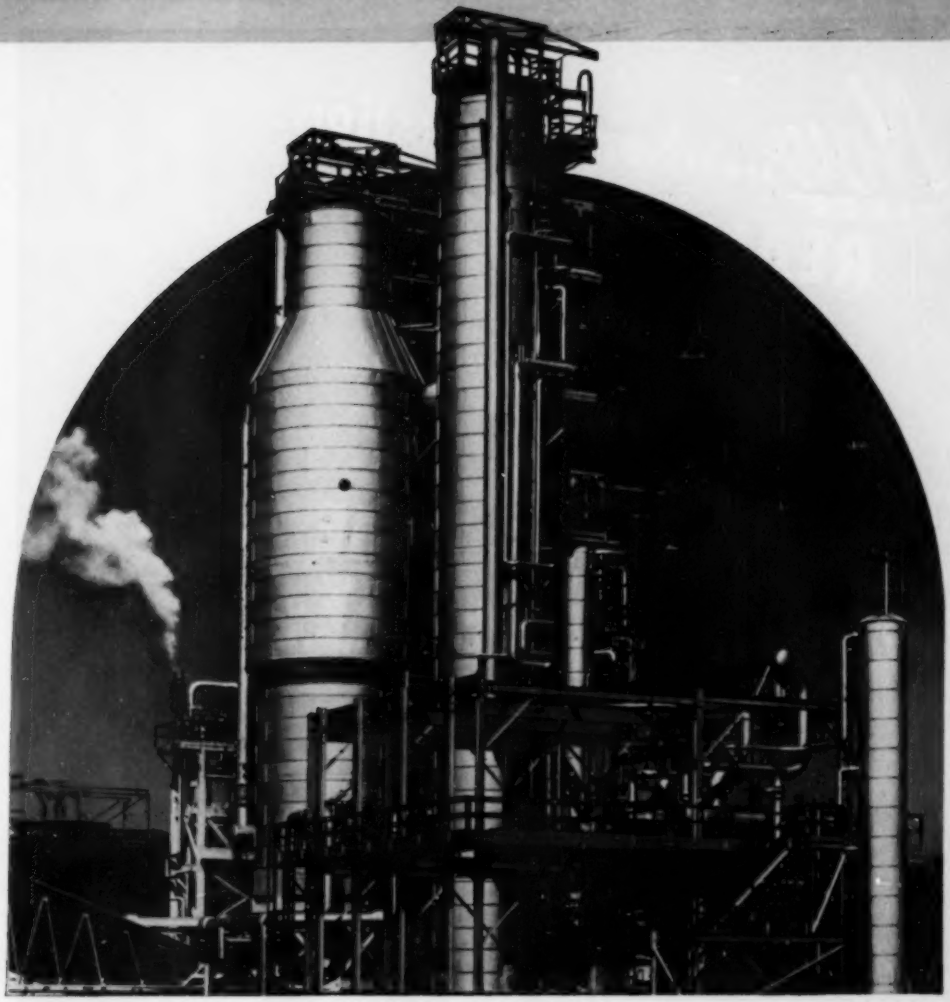
That test, begun 15 years ago, is still going on because the **hose never wore out!!!** The workmen are more efficient with the easy-handling Fairway Hose, and the company (now a confirmed Republic customer) is tickled to death since eliminating hose repair and repiacement costs

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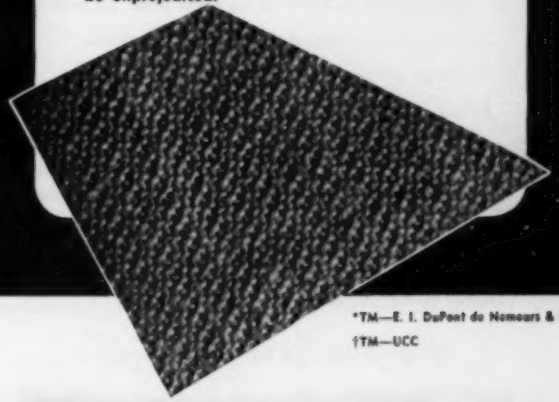
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for the

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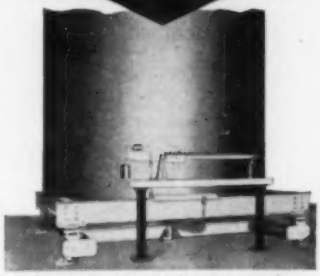
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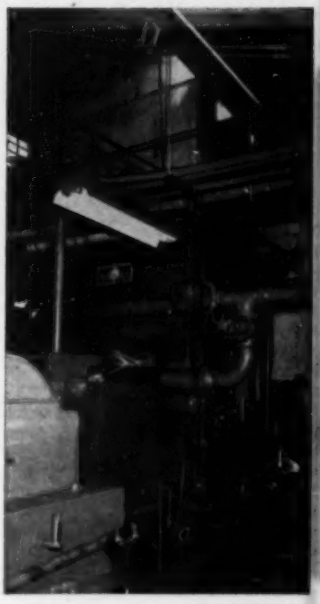
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(Where steam, or gas is available for atomizing) safely and efficiently burns residuums obtained from process. Send for Bulletin No. 23.

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—the "AIROCOOL" Gas Burner in combination with a TYPE "S-A-R" Oil Burner. Send for "AIROCOOL" Brochure.

"AIROCOOL" GAS BURNER

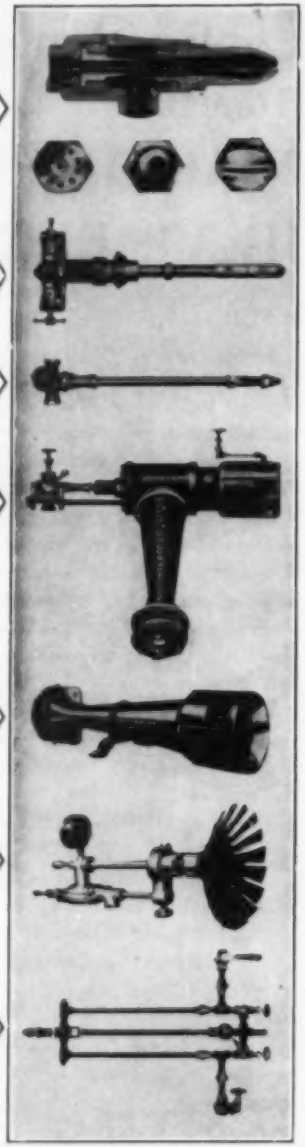
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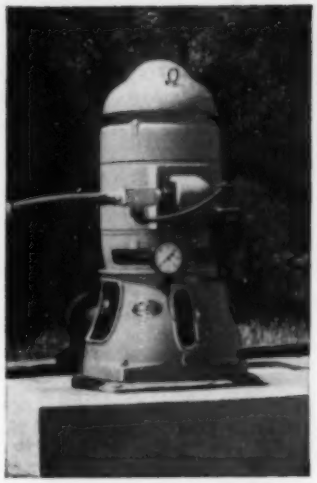
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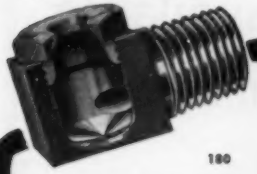
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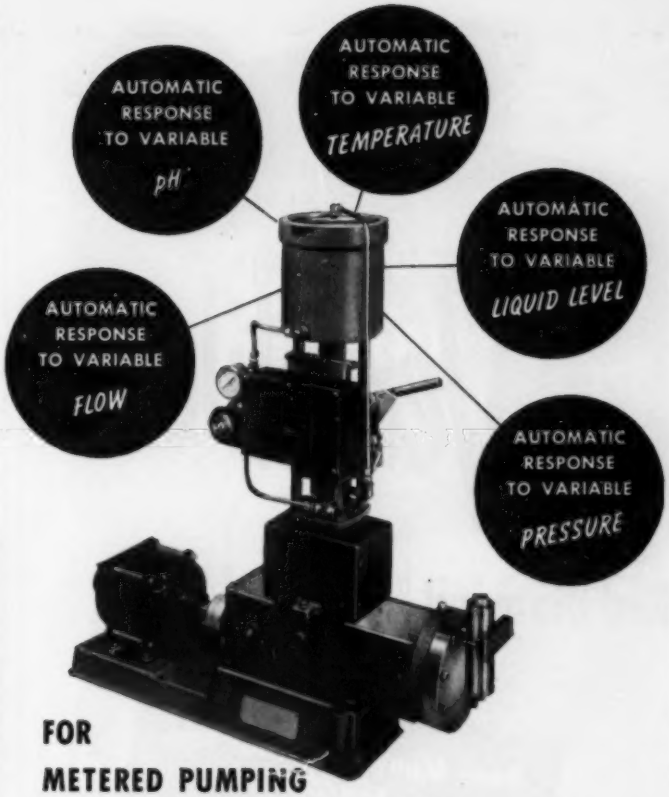
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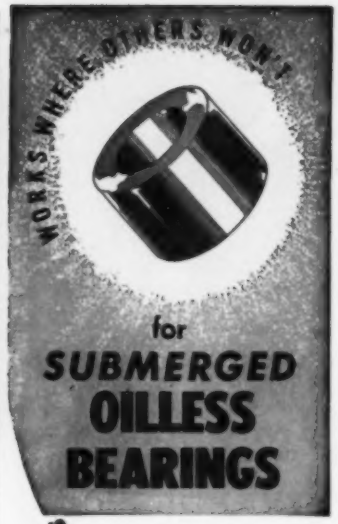
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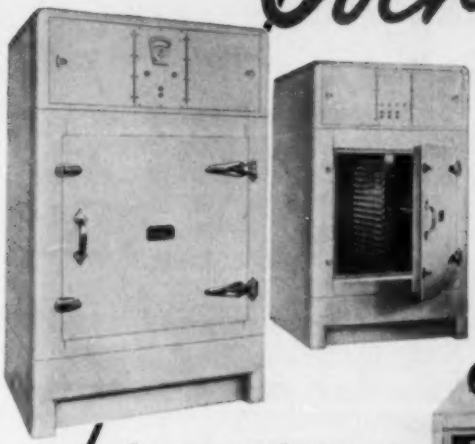
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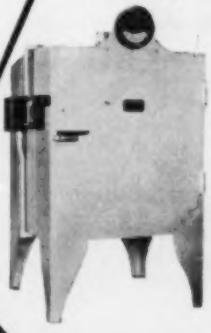
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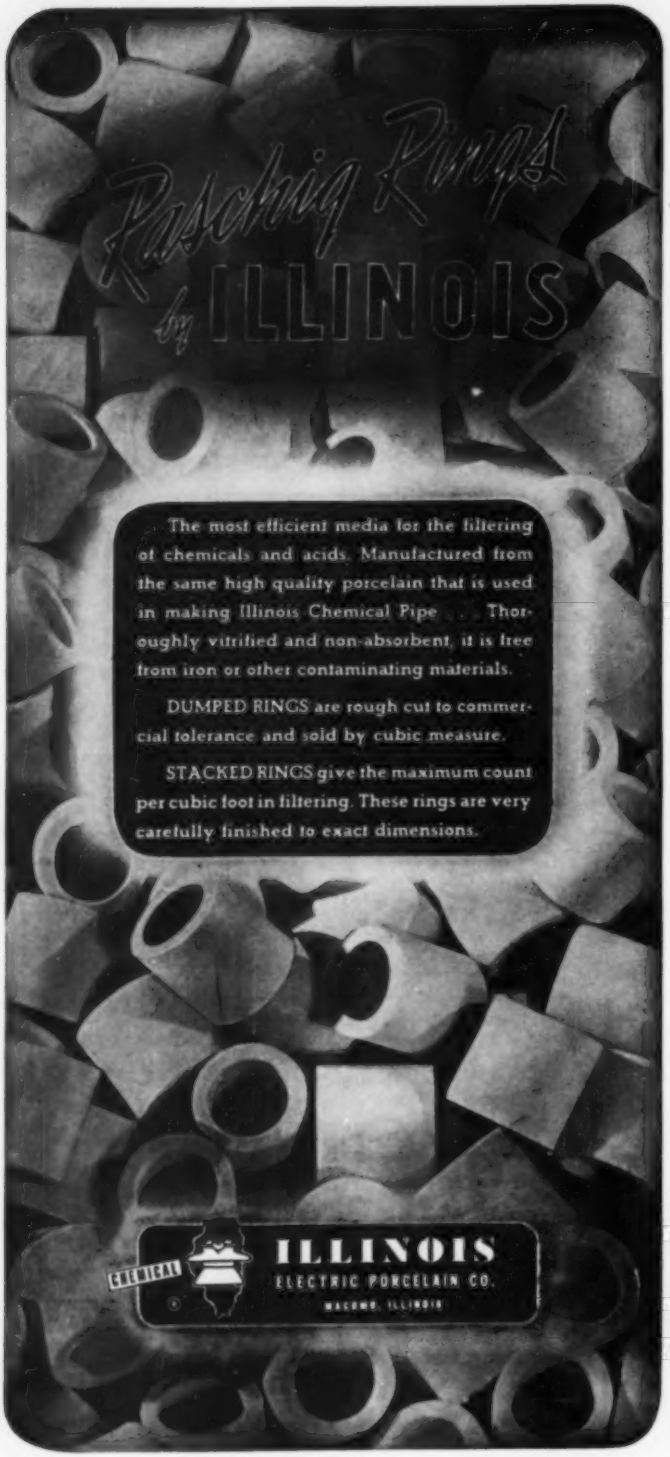
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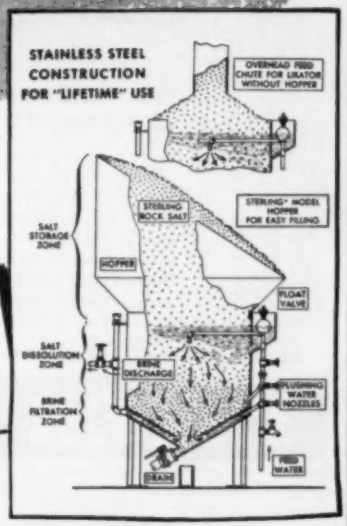
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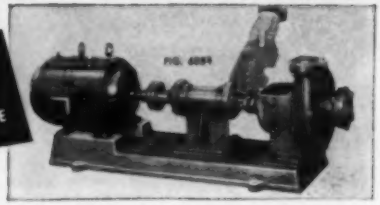
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Custom Grinding—Well-established company in New Jersey offers facilities for fine grinding of metallics and non-metallics to flake, chip and grain forms. Specialists in hazardous products. Packing, mixing, and shipping facilities available. CWW-2418, Chemical Engineering.

Glass Blowing—Production Work and special apparatus made to your specifications. Good service and workmanship at reasonable prices. CWW-2304, Chemical Engineering.

PATENTS

CONSULT: Z. H. POLACHEK,
Reg. Patent Attorney, 1234 Broadway, New York 1, N. Y.

MANUFACTURER WANTED

Are you interested in expanded sales in the chemical equipment and process fields? Two sales-engineers having fifteen years' experience, each with separate nationally prominent equipment concerns, are organizing a sales office in New York. We have developed custom and standard equipment sales in the millions and count among our personal friends hundreds of live buying contacts, large and small, in industry, government and export. Among these are the most desirable accounts in the East. This wealth of contacts, training and experience can be yours without any investment in cost or time.

If you have a fairly well equipped shop, can fabricate competitively and conduct business using ethical engineering practices we can accelerate your progress through profits. Because we are top-flight engineers as well, we will establish you in a broader range of sales by an intensive promotion of your present lines and by developing for you newer and more lucrative products.

If you are the manufacturer we would like to represent we can show you in black-and-white the unusual opportunity being offered by this hard hitting, ground covering, well connected team.

BA-2255, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

PLASTIC PLANT
FOR SALE OR RENT

Equipped for Pulp & Fiberglass Moulding, also drawing of Thermoplastics, Special formulas, etc.

CREATIVE MOULDED PRODUCTS Co.
434 Sixth Ave., New York 11, N. Y.

Available
- CUSTOM REFINING FACILITIES
- Distillation • Extractions
- Separations • Fractionation
- Drum Lots—Tank Cars

Wanted
- All Types of Crude Mixtures
- By-Products, Residues, Wastes
- Contaminated Solvents

TRULAND
CHEMICAL & ENGINEERING CO., INC.
Box 426, Union, N. J. UNionville 2-7360

WILL BUY

Cancelled - Unshipped - Rejected or Over-Stocked

CHEMICALS—DRUGS
SOLVENTS
PHARMACEUTICALS
OILS—PIGMENTS, ETC.

Chemical Service Corporation
80-04 Beaver St. New York 5, N. Y.

WANTED

(Additional Wanted ads on page 518)

CHEMICAL PLANT
WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.

Address all replies

"Confidential" C. J. GALE, Sec.
250 Broadway, N. Y. 7, N. Y. BA 7-1819

WANTED
To Expedite Production

Process Machinery including Vacuum Dryers, Heavy Duty Mixers, Reaction Kettles, Columns, Rotary Filters, Filter Presses, Pulverizers, Packaging and Wrapping equipment, S/S and non-corrosive Storage Tankage.

Will consider set up plant now operating or shut down. When offering give full particulars.

P. O. Box 1351
Church Street Sta., New York 8, N. Y.

Compressors Wanted
STATIONARY - PORTABLE
LARGE OR SMALL
L. W. BAUER
265 Essex Avenue Bloomfield, N. J.

WANTED
Model H 7 or Model L 6
NASH VACUUM PUMP
LUBRIZOL CORP.
Box 3057 Cleveland 17, O.
RE, 1-2200

WANTED METAL-SCRAP
Buyers of
- Copper Scale
- Copper Oxides
- Copper Catalyst
- Copper Powders

OPELL METAL ASSOCIATES
4 E. 41 Street New York 17, N. Y.
MUrray Hill 3-8421-2-3

Additional Positions Vacant Advertising on page 500

OPPORTUNITIES FOR EXPERIENCED ENGINEERS

in

ATOMIC ENERGY INSTALLATIONS

at

Oak Ridge, Tennessee and Paducah, Kentucky

INDUSTRIAL AIR CONDITIONING — Design of plant systems.

CONSTRUCTION—Plant design and construction, coordination of procurement and installation of process equipment.

DESIGN - DRAFTING — Chemical plants, structures, piping, utilities, alterations.

INSTRUMENTATION — Design, development and industrial application of electronic and pneumatic instruments.

MACHINE DESIGN—Jigs, fixtures, gadgets, remote control equipment.

NUCLEAR REACTORS—Chemical and Mechanical Engineers for design, development and construction.

POWER—Design, testing, construction of large electrical power generation and distribution installations.

PROCESS—Chemical process and equipment design, vacuum or high pressure systems, pilot plant and production operations.

SAFETY—Pressure vessel inspection, fire protection.

LABORATORY—Chemical Research and development.

Salary commensurate with training and experience

Give experience, education, age, references, personal history, salary received and salary expected.

Central Technical Personnel Office

CARBIDE and CARBON CHEMICALS COMPANY

a Division of

UNION CARBIDE AND CARBON CORPORATION

Post Office Box P

Oak Ridge, Tennessee

ENGINEERS

Chemical - Mechanical - Piping - Process

Long term openings in permanent offices located at Cleveland, Ohio and Frederick, Maryland offering good salary plus overtime (forty eight hour week) for qualified Engineers, Group Leaders and Designers experienced in one or more of the following phases of industrial plant design:

PROCESS PIPING
INSTRUMENTATION
PROCESS EQUIPMENT LAYOUT
PACKAGING
AIR CONDITIONING
PLUMBING
TANKS AND VESSELS
BOILER HOUSES
PLANT LAYOUT
CONVEYORS
HEATING AND VENTILATION
SPRINKLERS
WATER TREATMENT

Limited number of openings for Estimators experienced in Mechanical and Chemical installations as well as building construction.
Also have a number of openings in our Cincinnati and New York City offices for similar type personnel.
Excellent working conditions with paid vacations, sick leave plan and participating Group Insurance Program.
Please submit complete resume stating experience, education, salary required and date available to:

The H. K. Ferguson Company

Engineers and Builders

Ferguson Building — **Cleveland 14, Ohio**

ALBERTA

CANADIAN CHEMICALS COMPANY, LTD.

EDMONTON, ALBERTA, CANADA

Experienced Canadian Personnel Only

Chemical engineers for production supervisory positions in Petrochemical & Cellulose Acetate divisions

Experienced men for production supervisory positions in Yarn & Staple Fibre Division

Reply with personal background, education, experience, and salary expected. Personal interviews will be arranged.

All replies will be held confidential.

ADDRESS REPLIES TO PERSONNEL SUPERINTENDENT

CELANESE CORPORATION OF AMERICA

BOX 148, BISHOP, TEXAS

CONSTRUCTION SUPERINTENDENTS and ENGINEERS

Large chemical company requires construction superintendents and engineers for regular full-time positions in central and eastern U. S. locations. Chemical plant experience beneficial. Full details of exp, age, salary expected, and when available for work must be given in first letter.

Box CE-1523, 221 W. 41 St., N. Y. 18

ENGINEERS

CHEMICAL — MECHANICAL

For product development, production supervision, engineering and maintenance. Some experience in fine grinding of chemicals, minerals, insecticides with Raymond, Williams and fluid energy mills desirable. B.S. degree and 3-6 years industrial experience required. Unusual opportunity for individual initiative and advancement in small, rapidly growing unit of large corporation. Please write complete record of experience, education, salary, references.

P-2221, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

WANTED

Construction Engineer

(Mechanical or civil) for process plant. Experienced in heavy construction, including buildings, piping, and machinery installation.

Also, Design Engineer

(Mechanical or civil) for process industry. Familiar in heavy industry plant construction, including design, equipment specifications, and machinery installations.

These positions in modern, expanding plant in northern Ohio River valley. Attractive insurance and pension plans, desirable community, excellent opportunities for competent men.

P-1788, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

PRODUCTION SUPERVISION

Rapidly expanding, medium-size company engaged in chemical, rubber, and plastics operations has several production supervisory openings with excellent potential for advancement. Engineering degree necessary. Business Administration training and/or industrial experience desirable.

P-2168, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

Ch. E. WANTED

Ten Years Experience handling bulk chemicals and Labor Problems.
Position: Ass't Plant Supt. Excellent Opportunity.
Location: Southwest.

P-2118, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

MECHANICAL ENGINEER

Wanted for responsible position in Research Department of well established Western New York Company manufacturing fibre wallboard and coating compositions. College graduate. Practical experience in machine design essential. Please address resume of qualifications, salary requirements and photo if available to:

P-2240, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

TECHNICAL SUPERINTENDENT

To work on special plant process problems reporting directly to Plant Superintendent of new plant in Boston area. Assignments will concern cost reduction, improvement of quality and yields, production cycles and process design. Bachelor's degree in Chemical Engineering and several years experience in organic chemicals or rubber.

P-2423, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

Additional Positions Vacant Ads on page 498 and 499

F M C

$1500 PRIZE CONTEST

SUBJECT:
"My Happiest Experience With Used Equipment"

CONTEST STARTS

Contest starts with the month of November 1951 and ends October 1952 inclusive. (12 months).

Statements will be judged on the basis of sincerity, originality and uptness of thought.

Some men know how much they have been helped by used equipment; others do not. This contest is sponsored by the First Machinery Corp. to spread that knowledge as a service to Industry. Your experiences in buying, using or selling equipment to be adapted for another purpose will demonstrate its value.

In this time of emergency, the First Machinery Corp. wants every plant operator to realize that good existing used equipment can be utilized to stretch scarce materials, to eliminate months of delay, to furnish immediate production facilities. That is the prime purpose of this contest.

The RULES!

Write a statement on the subject "My Happiest Experience With Used Equipment". It is not required that the equipment shall have been purchased from FMC.

Entries are limited to one a month for each contestant.

Entries become the property of The First Machinery Corp. with permission to publish, none returned. Winners will be notified by mail as well as publication in this periodical.

This contest is subject to Federal, State and Postal regulations.

Contest open to any person connected with the Chemical and allied industries except employees of the First Machinery Corp., their Advertising Agency and their families.

The JUDGES!

DR. WALTER J. MURPHY,
Editor of American Chem. Society Publications

MR. T. R. OLIVE,
Editorial Staff of McGraw-Hill Publications

MR. FRED R. FIRSTENBERG,
President of the First Machinery Corp.

Send your Contest Entry to Contest Editor, Care of

Cash Prizes are $100. a month for 12 Months. $300. for the Best Article of the Year.

FIRST MACHINERY CORP.

157 HUDSON ST. WOrth 4-5900 NEW YORK 13, N. Y.

A STITCH *in* TIME...



HERE'S YOUR STOCKPILE FOR INDUSTRIAL MOBILIZATION

In these days of emergency the fable of "A Stich in Time" should be an object lesson. The growing scarcity of industrial materials drained off by military needs reflects the coming unavailability of equipment. It means you had better "sew up" your machinery requirements NOW.

Mixers

Baker Perkins (W. & P.) type heavy duty jacketed Mixers; jacketed; double arm; geared both sides; sizes from 15 gal. to 3,500 gal.

Sprout Waldron Monarch type heavy duty double ribbon MIXERS, 240 cu. ft. capacity; internal stuffing boxes; center discharge, 8" x 8"; bowl, 5' x 10'.

NEW and Used Dry Powder Mixers up to 5000 lbs.

Lancaster Model EAG4, Mixer complete with Hood Loading Elevator, Dust Collector and other accessories.

Philadelphia 2 Speed Reduction Drives; Ratio 20.1:1; Output 87/29; H.P. 2/.67; RPM 1150/560.

SPECIAL

5 Porcelain lined Pebble Mills 8' x 8' with 50 hp Gear Motors.

Evaporators, Stills, Reactors and Retorts

Swenson Quadruple Effect Steel Evaporator with one extra spare body; heating surfaces are 5029-4400-3820-3000 sq. ft. long tube vertical film type; heating elements are 1½" 12 gauge steel tubes, 24' long; included are flash heaters, catchalls, flash tanks.

650 gal. Copper Jacketed Vacuum Pan, 54" x 37" Str. side.

250 gal. Aluminum Jacketed Vacuum Pan.

Stokes 500 gal. Stainless Steel Evaporator or Reactor with barometric condenser; jacketed.

Rogers 6' Stainless Steel Vacuum Pan, complete with accessories.

3,500 gal. Jacketed and Agitated Reactor; 200# ASME coded vessel, 16' x 16'6" with agitator, motor, condenser, pump, etc.

Dopplop Cast Iron Reactor, 40" x 60", jacketed.

2 Type 316 Stainless Steel 50 gal. Jacketed and Agitated Reactors, 30" x 32".

Perfect Sphere Copper Vacuum Pan, diameter 76" complete with dephlegmator.

Zahn & Nagel Continuous Concentrator; 2500 lbs. water per hour evaporated.

Pfaudler made 5000 Gal. Vertical Jacketed Steel Tank; 9'6" x 9'10½".

Allberger Karbate Hydrochloric Acid Absorber includes Tower with raschig rings, heat exchanger and accessories.

4 Horizontal Autoclaves, Retorts or Sterilizers or Dryers; 5' x 14' with tracks; capstan closing.

1 Same as above 5' x 5'6".

Monel Water Distillation Unit Vacuum Compression Type 50 GPH.

2 Haveg Reactors, 225 gal. and 250 gal. capacity.

Centrifugals

Continuous Centrifugal Filters by Bird, Laughlin, Baker Ter-Maer, and others.

Sharples Stainless Steel Super Centrifuge Misco type; 3 H.P.

Sharples and De Laval Centrifugals and Clarifiers for all purposes; state requirements.

Centrifugals (Con't.)

Tolhurst 40" Self Balancing Centrifugal Extractor, with copper perforated basket, with 7½ H.P. 2 speed motor.

A. T. & M. Stainless Steel 60" Link Suspended Centrifugal Extractors with vacuum tight covers.

Colloid Mills, Homogenizers

Premier Liquid Type Colloid Mill Model L-15 with 30 H.P. motor.

Premier Paste Type U3 Colloid Mill; Stainless with 30 H.P. motor.

3 Langsenkamp Stainless Steel Pulpers or Strainers EZ Adjust.

Large Stock of Colloid Mills, Eppenbach, Charlotte, U. S. and others up to 50 H.P.

Mills

Hammer Mills and Pulverizers; Mikro, Gruendler, Robinson, Williams, Jeffrey, Raymond; all types and sizes.

Pebble Mills from 18" x 24" to 60" x 72"; some with motors, pebbles, etc.

Hardinge Conical Ball Mills; 3' x 6"; 3' x 8"; 5' x 22"; 5' x 36"; 6' x 22"; 8' x 30" . . . manganese, steel, other liners.

Standard make 3 Roll Mills, by Lehman, Day, Ross and others; 12" x 32"; 16" x 40"; and others.

Rubber and Textile 3 Roll Calenders, 14" x 42"; 18" x 54"; also Calender Rolls, Steel, Rubber and cloth covered—all sizes.

The E-M-C

Rental - Purchase Plan Offers Many Advantages

Minimum cost outlay for short contract, pilot plant or experimental product.

Monthly rental fee charged up as running cost, permits the equipment to pay for itself.

The rental period also serves as trial period for the equipment. Answers the questions: is it applicable for my production; is it in good condition; is it worth the money; THEN you can determine whether to return it, or finish paying for it or to extend the rental period.

Additional Details on Request

CHEMICAL SHOW TIME

If you plan to visit New York at the time of the Chemical Show, you are cordially invited to drop in at the First Machinery Suite No. 1033 at the Belmont Plaza Hotel, Lexington Ave. at 49th St. adjacent to the Grand Central Palace.

FIRST MACHINERY CORP.

or-THE CRY of "WOLF!"



The story of the boy who cried "WOLF" many times in jest and finally in earnest; only to remain unheeded is very well known. BUT American industry is getting "loaded for BEAR" a different species of animal. Prepare YOUR plant for top production. Our tremendous industrial capacity is a weapon no other country can match. It is our GREATEST arm.

GOOD USED EQUIPMENT AVAILABLE IMMEDIATELY

RESIN and CHEMICAL MANUFACTURING INSTALLATION

consisting of

250 Gal. MONEL REACTOR, 38"x48" jacketed and agitated; XPL motor with S.S. 100 sq.ft. Condenser.
200 Gal. STAINLESS Vacuum Receiver.
734 Gal. MONEL coil heated Tank 5'x5'.
470 Gal. STAINLESS Jacketed and agitated Sulphonator.
95 Gal. STAINLESS Mixing Tank; agtd.
700 Gal. Lead Lined Mixing Tank; agtd.
15 Gal. Pfaudler Glass Lined Jacketed and agitated Reactor with Condenser and 15 Gal. G.L. Vacuum Receiver.
Complete with interconnecting piping, valves, controls, instruments etc.

Filter Presses and Filters

3 Shriver RUBBER COVERED Plate and Frame Filter; 36" with 35 chambers; closed delivery.

Sperry 36" ALUMINUM Plate and Frame Filter Press; 33 Chambers; closed delivery.

Oliver, Sweetland Type Pressure Filters, from No. 1 to 12 inclusive.

Bird Young Rotary Vacuum Filters, 4' x 4'; 4' x 2'.

Oliver Continuous Rotary Vacuum Filter. Dorrco type with nickel contact parts, 6' x 3'.

Rotex and Ro-Ball Gyratory Sifters up to 40" x 120".

20 minutes from the show
TO THE FMC WAREHOUSE

After you have seen and admired all the new equipment exhibited at the Show and have been informed you CAN'T get it NOW . . . we suggest that you visit the FMC New York Warehouse where you can duplicate many of these machines and THEY ARE AVAILABLE IMMEDIATELY.

Dryers

Buflovac 20 Shelf Vacuum Chamber Dryer, complete with Condenser, Receiver and Vacuum Pump.

Rotary Dryers; Squier Stainless 2'6" x 20'; Huhn Dryer 3' x 12'; Adt Dryer 2' x 15'; Hersey 3' x 24'.

Nickel Plated Rotary Drum Dryer, by Black & Clawson, 48" x 46".

Stainless Drying or Flaking Rolls, from 32" x 50" to 60" x 120".

Louisville Counter Current Monel Lined Dryer, 38" x 16' long.

Steel Jacketed Dryer or Cooler, with agitator, 54" x 18' long.

Steel Rotary Vac. Dryer, 4' x 8' with 10 H.P. motor.

Double Drum Dryers, 2' x 2' and 28" x 60".

Proctor & Schwartz Continuous Apron Conveyor Type Dryer, 44' long.

Special Offerings

Struthers Wells Stainless Steel Heat Exchanger; 1,000 sq. ft.

4 Tanks fabricated of Type 316 Stainless Steel, 200 gal., 250 gal., three with agitators.

Girdler Votator with stainless tube 6" x 48"; jacketed.

French Oil Mill Curb Press, 24" x 36" with two posts 10" sq. 450 ton pressure complete with hydraulic press.

Williams Ring Roll Mill, ring 10" x 3" having three rolls 4" x 3" complete with cyclone, dust collector, and vacuum separator.

2 Horix Stainless Steel Gravity-Vacuum 14 Stem Filler; Model HEV 14.

Standard Knapp Automatic Gluer and Sealer; Model 429-606.

LIQUIDATING LARGE ORGANIC CHEMICAL INSTALLATION

6 Sextuple effect G-B long tube steel evaporators.
3 All copper Calandria evaporators, double, triple & quadruple effect.
3 Bronze Vacuum Drum Dryers 5' x 10'.
1 Chrome plated Vacuum Dryer 5' x 10'.
24 High pressure acid Brick Lined Digestors or Autoclaves.
2 No. 12 Stainless Sweetland Filters.
50 Wood Tanks 20,000 gal. 4" staves.
Heat Exchangers, Condensers, and 10 Miles of Copper Pipe & Valves 1" to 6" I.P.S.

Special Offerings (Con't)

Tablet Presses by Stokes and Colton, single punch and rotary models for every need; please state exact requirements.

Climax Sterilizer or Pressure Vessel; rectangular 42" x 48" x 8' steam jacketed; hinged doors both sides.

G.E. Turbine Generator 375 KVA complete with Switchboard and accessories.

Stokes & Smith, Model G1, Auger Powder Filler with vacuum-packed head.

RELEASE YOUR IDLE EQUIPMENT

Use FMC as your equipment trading post. Your old, idle, surplus equipment can help you pay for the machines you DO need, and may be sorely needed elsewhere for defense production.

Send us your list with complete information

157 HUDSON ST. NEW YORK 13 N.Y. WOrth 4-5900

AVAILABLE

FOR SALE or LEASE

COMPLETE MODERN PLANT

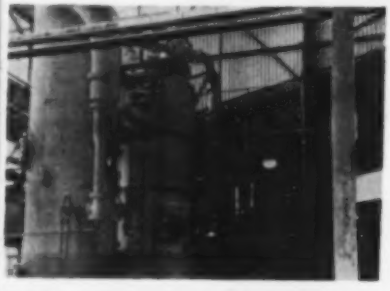
FULLY EQUIPPED FOR

Chemicals • Pharmaceuticals • Foods

LOCATED in the RIO GRANDE VALLEY at McALLEN, TEXAS. Seven buildings of steel, brick and transite, some 3 and 4 stories, located on a 10 acre area. Good labor market, natural gas supply, ample water with water treating system, storage facilities and air-conditioning system are some of the advantages.



Arrangements can be made to produce for you if desired.

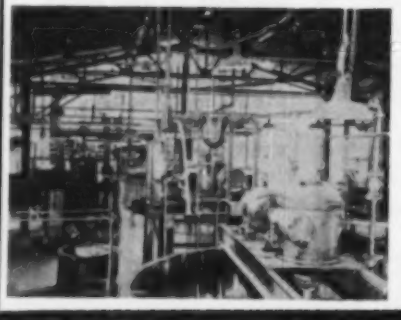


MODERN EFFICIENT EQUIPMENT

Highly Adaptable for Many Purposes
Ready to Turn on Steam and Operate

This modern, efficiently engineered plant is highly adaptable for many purposes with late type equipment, installed NEW and still equal to new. It's ready to turn on steam and go to work for you.





Principal Items of Equipment

- ★ 2 Bird Centrifugals, rubber covered.
- ★ Zaremba Inconel Evaporator.
- ★ Pfaudler XL Reactor, 1,000 gal. capacity.
- ★ 2 Stainless Drum Dryers, drums are 5' x 10'.
- ★ 2 Sperry 30" Filters.
- ★ Gas Fired Boiler, 317 HP.
- ★ 2 Mikro Pulverizers.
- ★ Louisville Steam Tube Dryer and Cooler.
- ★ Stainless Bucket Elevator.
- ★ Stainless Moyno Pumps.
- ★ Stainless Piping-Tubing.
- ★ Tanks up to 20,000 gals. in Stainless, Wood, Steel.
- ★ 15 Agitators, "Lightnin" and New England Types.
- ★ Complete Pilot, Testing Laboratory.
- ★ Lab. Drum Dryer in Stainless and Rubber.
- ★ Ovens, Balances, Glassware.
- ★ Distillation Apparatus.
- ★ Large Stock of replacement parts, stand-by material and accessories usually found in modern plants.

For full information, Photographs, Blue Prints, Flow Sheets write to Fred R. Firstenberg, President.





FIRST MACHINERY CORP.

157 HUDSON ST. WOrth 4-5900 NEW YORK 13, N. Y.

Welcome
TO THE CHEMICAL SHOW

WE MERCHANDISE EQUIPMENT

While you are in New York, arrange to inspect our warehouse in Phillipsburg, N. J. Transportation will be provided there and back. Phone us at Hanover 2-4890, and we will make all arrangements to suit your convenience.

ABSORBERS
ACCUMULATORS
AUTOCLAVES
BINS
BLENDERS
BLOWERS
BOILERS
CEMENT EQUIPMENT
CENTRIFUGES
CLASSIFIERS
COLUMNS
COMPRESSORS
CONDENSERS
CONVEYORS
COOLERS
CRUSHERS
- CONE
- GYRATORY
- JAW
- ROLL

DIGESTERS
DRYERS
- ATMOSPHERIC
- VACUUM
- DRUM
- SHELF
- TUNNEL

DUST COLLECTORS
ELEVATORS, BUCKET
EVAPORATORS
FEEDERS
FILTERS
- PRESS
- PRESSURE
- ROTARY

GRAINERS
GRINDERS
KETTLES
KILNS

MILLS
- BALL
- COLLOID
- HAMMER
- PAINT
- PUG
- TUBE

MIXERS
PACKAGING EQUIPMENT
PAINT MACHINERY
PAPER MACHINERY
PLASTIC MACHINERY
PULVERIZERS

PUMPS
- CENTRIFUGAL
- CONDENSATE
- PISTON
- VACUUM

QUARRY EQUIPMENT
REACTORS
REDUCERS
REFINERY EQUIPMENT
REFRIGERATION
SOAP MACHINERY
SPRAY UNITS
STILLS

TABLET PRESSES

TANKS
- PRESSURE
- STORAGE
- ALUMINUM
- CAST IRON
- GLASS LINED
- HAVEG
- MONEL
- RUBBER LINED
- STAINLESS STEEL
- STEEL

TOWERS
- ABSORPTION
- BUBBLE CAP
- PACKED
- SCRUBBING
- SPRAY

VACUUM PANS
VAPORIZERS
VARI-SPEED DRIVES
VIBRATORS
WEIGHING MACHINES
WELDERS

PIPE & TUBING
- ALUMINUM
- BRASS
- BRONZE
- HASTELLOY
- HAVEG
- KARBATE
- MONEL
- RUBBER LINED
- STAINLESS STEEL

FITTINGS, VALVES

CONTACT US WHEN BUYING OR SELLING

Heat and Power Co., inc.

70 PINE STREET | **HAnover 2-4890** | **NEW YORK 5, N. Y.**

MACHINERY & EQUIPMENT MERCHANTS

WELCOME TO THE CHEMICAL SHOW



HOTEL LEXINGTON
AT OUR SUITE NO. 1609-10
LEXINGTON AVE AT 48th STREET

Join in convivial fellowship or, without obligation, discuss the quick delivery of equipment not otherwise available. Just drop in at the Brill Equipment suite November 26th-Dec. 1, or our offices anytime. Glad to greet you!

BRILL

• SPECIAL • OFFERINGS

2—Oliver 8'x10' Monel Rotary Vac. Filters, complete.
1—Link Belt 11'6"x35' Steel Roto-Louvre Dryer.
1—Link Belt 2'7"x8' Monel Roto-Louvre Dryer.
1—Raymond #4237 three-roll High Side Mill.
1—Raymond three-roll Midget High Side Mill.
1—Baker Perkins Type JNM 100-gal. Jacketed Mixer.
1—Tolhurst 32" Suspended Type Centrifugal monel perforated basket.
2—Buflovak 32"x100" Atmospheric Double Drum Dryers, complete.

Another BRILL *Liquidation*

SYNTHETIC RESIN PLANT • • • LOCKPORT, N. Y.

1—BOWEN 16' diameter SPRAY DRYER with two high speed spray machines, Bowen atomizers, fans, Sirocco dust collectors, controls, etc.
1—ROGERS 16' diameter SPRAY DRYER complete with fans, Dracco dust collectors, heating and pumping system, controls, etc.
1—350 gal. stainless steel lined jacketed, agitated KETTLE, m.d.
2—10' x 14'7", (8000 gal. each) stainless steel lined VERTICAL TANKS.
1—50 ton WORTHINGTON 7" x 7" Type VSA new 1949 two cylinder AMMONIA COMPRESSOR with gauges, controls, V-belted to 50HP motor and with EV-126-A York evaporator condenser and receiver, etc.
1—1 ton YORK AMMONIA COMPRESSOR with tank and expansion coil.
1—15' x 25' x 9' deep with 3' cone bottom chute collapsible STEEL BIN on structural steel supports.
10—Steel TANKS 100 to 1000 gal., some agitated.
1—Atlas Type "U", 24' long portable BULK LOADER with rubber belt, motor driven.
1—40" x 7' rubber lined TANK.
1—Syntron Barrel Shaker, Type V200.
5—PORTER ¼ HP, Type V-153 Agitators.
3—"U" Type and flat rubber Belt Conveyors.
2—KEELER 125 HP, ASME CODE water tube boilers with McClave Stokers.

Pumps, Blowers, Fans, Transformers, Motors, Starters, Recorders, Office and Lab. furniture

PROPERTY consists of 20,000 sq.ft. of building with all utilities and sprinkler system, and over an acre of land. Excellent opportunity to utilize Spray Dryers on location.

Partial List Only—Write For Detailed Circular

"A BRILL BUY IS THE BEST BUY"

BRILL
EQUIPMENT COMPANY
2401 THIRD AVE. New York 51, N. Y.
Telephone Cypress 2-5703

DEPENDABLE EQUIPMENT

SINCE 1926

CENTRIFUGALS

2—Tolhurst 48" Center Slung S.S.
2—Tolhurst 40" Suspended Everdur Perforated Baskets.
1—Fletcher 40" Suspended Steel Solid Basket.
1—Tolhurst 32" Suspended Monel Perforated Basket.
1—Tolhurst 28" Suspended Type Steel Perforated Basket.
2—AT&M 20" rubber-covered underdriven.
1—Bird 18"x28" Solid Bowl, Continuous, Steel.
2—Bird 36"x36" Solid Bowl, Continuous, Rubber-covered.
1—Sharples #18 S.S.

FILTERS

2—Oliver Monel 8'x10' Rotary Vacuum.
1—Vallez #49 Pressure Filter, 41 leaves.
1—Sweetland #12, 36 S.S. leaves.
1—Sweetland #2 steel, 17 leaves.
6—Oliver Rotary Vacuum 11'6"x14', 6'x12', 8'x8'.
1—Oliver Rotary Vacuum Precoat 3'x4', Steel.
3—Feinc Rotary Vacuum 8'x12', 4'x5', 3'x2'.
1—Feinc Rotary Vacuum, 3'x1' S.S.
1—Shriver 24" recessed, 30 chambers.
3—Shriver 18" recessed, 30 chambers.
1—Shriver 42" Wood P&F, 42 chambers.
1—Sperry Aluminum 30" P&F, 28 chambers.
1—Sperry Aluminum 24" P&F, 22 chambers.
1—Shriver Aluminum 12" P&F, 12 chambers.
10—Shriver, Sperry Skeletons, 42", 30", 24", 18".

PULVERIZERS

1—Raymond 3 Roll Midget High Side Mill.
1—Raymond 3 Roll High Side Mill complete.
1—Bauer 36" Attrition Mill with 2—50 HP motors.
7—Abbe 6'x8', 5'x5', 4'6"x3'6", 3'9"x3'6", 2'6"x3' Pebble Mills.
7—Patterson 6'x10', 6'x8', 4'x5', 3'6"x4', 3'x4' Pebble Mills.
1—Mikro Pulverizer #1SH.
2—Premier Colloid Mills 8" dia. S.S.
1—Eppenbach QV7 Colloid Mill.
2—Jeffrey 24"x18", 20"x12" Hammer Mills.
2—Raymond 8', 4' Air Separators.
1—Ball & Jewell #1½ Rotary Cutter.
1—Albert 2 Roll Mill 6"x12".

SCREENS

1—Orville Simpson #42 Rotex Double Deck 40"x84".
1—Orville Simpson Rotex Single Deck 40"x56".
1—Robinson Double Deck 20"x48".
1—Tyler Hummer 4'x10' Single Deck with V-16 vibrator.
1—Tyler Hummer 4'x7' Single Deck with V-16 vibrator.
5—Tyler Hummer 3'x5' Triple Deck with V-16 vibrators.
1—Abbe #2 Blutergess Sifter.

KETTLES—TANKS

5—Steel 2000 gal. jacketed agitated closed 200# Pressure Kettles.
1—Turbo-Mixer 1000 gal. jacketed agitated closed Steel Kettle.
1—Pfaudler 200 gal. glass lined jacketed agitated Tank.
3—Dopp 250, 150 gal. jacketed agitated Kettles.
1—Buflovak 300 gal. steel jacketed Kettle, 100# internal pressure.
1—Stokes 200 gal. closed jacketed Steel Kettle.
8—S.S. 20 to 300 gal. jacketed Kettles, NEW.
7—Steel Pressure Tanks 3500, 8200, 12,500; 200 to 300 psi.
1—Buflovak 6' dia. Vacuum Crystallizer.
5—Sections Swenson Continuous Crystallizer.

MIXERS—ALL TYPES

1—Baker Perkins 300 gal. Unidor Mixer Size 18, S.S.
5—Baker Perkins 100, 20 and 9 gals. jacketed.
1—Baker Perkins 2 gal. Stainless, Double Arm.
10—Day, Rodgers 200# to 3000# Powder Mixers.
12—Electric Portable Agitators ¼ HP to 5 HP, NEW.
4—Day, Porter 8, 40 and 50 gal. Pony Mixers.
1—Eppenbach 1 HP Homo Mixer, explosion-proof motor.

DRYERS—KILNS

1—Natl. Drying Machinery 14 Truck Steam Heated Dryer 1680 sq. ft.
3—Proctor & Schwartz 8 and 6 sections Single Conveyor Dryers.
5—Buflovak, American Double Drum Dryers 42"x120", 32"x100", 36"x84", 32"x72".
1—Single Drum 60"x80" Steel Dryer or Flaker.
1—Link Belt 1106-35 Roto-Louvre Dryer 11'6"x35'.
1—Link Belt #287-8 Roto-Louvre Dryer 17'7"x8', Monel.
3—Ruggles Coles 70"x45', 70"x35', 4'x20' Indirect Heat Rotary Dryers.
5—Direct Heat Rotary Dryers 8'x80', 7'x60', 5'x67', 4'6"x40', 4'6"x25'.
3—Rotary Kilns 8'x125', 8'x100', 6'x80'.
4—Louisville 6'x50', 6'x30', 4'6"x25' Rotary Steam Tube Dryers.
3—Stokes, Buflovak 30"x8', 3'x15', 5'x30' Rotary Vacuum Dryers.
5—Buflovak Vacuum Drum Dryers 5'x12', 4'x8', 24"x20".

MISCELLANEOUS

12—Bucket Elevators, steel housings, 34' to 90' centers, 8"x6" to 24"x8" buckets.
7—Stokes Vacuum Pumps 15 to 100 CFM.
1—Milton Roy Proportioneer Pump, S.S. and Hastelloy, 10 GPM.
1—Oliver Horizontal Dry Vacuum Pump 400 CFM.
5—Devine, Buflovak Condensers and Receivers, 20 to 90 sq. ft.
1—Colton Single Punch Tablet Machine #5½.
4—Stokes DD2, D4, D3 Rotary Tablet Machines.
1—#1 Anderson Expeller.
2—Nash AL673 Hytor Vacuum Pumps.
1—Mitts & Merrill #10 Paper Shredder.
10—Olivite Durlron & Rubber Centrifugal Pumps, 1½" to 4".

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1—Pfaudler Glass-lined Evaporating Dish, 12 gal. cap.

1—Sperry Bronze Plate & Frame Filter Press, 18" x 18", 21 chambers.

4—Rubber-lined Storage Tanks, 1,000 gals. cap. each.

1—Tolhurst Stainless Steel Suspended type Centrifuge 40" Imperforated Basket.

10—Sharples Super Pressurite Centrifuges #6.

1—Sharples Super Pressurite Centrifuge, Stainless Steel Bowl, Model #16Y.

1—Jacketed Vacuum Autoclave, 850 gal. cap. with Agitator.

1—Blaw-Knox Jacketed Autoclave 3' x 4'2" with Agitator.

1—High Pressure Steel Autoclave, 900 psi., 3' x 4' with Agitator and Motor Reducer.

2—Blaw-Knox Jacketed Autoclaves with Agitator, 300 and 500 gal. cap.

1—Gemco Copper Conical Blender, 3½ cu. ft.

1—Kewanee 125 H.P. Boiler, 125 lbs. pressure

2—Black & Clawson Double Drum Dryers, 28" x 5'.

1—Louisville Rotary Steam Tube Dryers, 6' x 50'.

3—Buflovak Vacuum Drum Dryers, 24" x 22".

2—Buflovak Vacuum Drum Dryers, 5'10" x 10".

5—Louisville Rotary Steam Tube Dryers, 6' x 25'.

1—Buflovak Double Drum Dryer, 32" x 90".

1—Fitzpatrick Stainless Steel & Bronze Model Comminuting Machine.

1—Artesian Metal Works Steel Jacketed Kettle, 1000 gal. cap. with agitator.

1—Ross 30 gal. cap. Change Can Mixer.

3—Shriver Cast Iron Filter Press, 36" x 36", Closed Delivery, 25 & 36 Chambers.

1—Sperry Cast Iron 30" x 30" Filter Press. Recessed Type, 55 Chambers, Open Delivery.

6—Cast Iron Jacketed Kettles, 210 to 600 gal.

1—J. P. Devine Vacuum, Jacketed Kettle, 2000 gal. cap.

9—Steel Electrically Heated Kettles, 450, 900 & 1000 gal. cap.

1—Sanbury Mixer #1 with 50 Hp motor.

3—Baker Perkins Double Arm Mixers, 200 gal. cap., sigma blades.

2—J. H. Day Mogul Type Mixers, 2½ & 5 gal. cap.

5—Simpson #10 Intensive Mixers, "Unused".

1—Patterson Porcelain Lined Pebble Mill, Type D, with 25 HP motor.

3—Hardinge Conical Ball Mills, 8' x 30", 5' x 22" and 4' x 22".

2—Swenson-Walker Stainless Steel Jaacketed Crystallizers, constructed of 316 Stainless Steel, each Crystallizer equipped with 4-10' sections.

5—Dowington Stainless Steel Heat Exchangers, 500 sq. ft. each.

1—Nickel Jacketed Vacuum Kettle, 65 gal. cap.

2—Stainless Steel Open Top Jacketed Kettles with Stainless Steel Jacket, 20 and 50 gal. cap.

2—Stainless Steel Packed Columns 30" x 32'.

1—Stainless Steel Hydrogenator, 360 cap. 250 lbs. PSI.

1—Niagara Stainless Steel Filter, 146 sq. ft.

2—Sperry Rubbed Covered Plate and Frame Filter Presses, 24" x 24" Open Delivery, 14 Chambers.

2—Stainless Steel Jackated Vacuum Kettles, 250 gal. cap.

1—Nickel Jacketed Kettle, 400 gal. cap.

1—Nickel Jacketed Vacuum, 10 gal. cap.

1—Stainless Steel Jacketed Vacuum Kettle with agitator, 250 gal. cap.

1—Stainless Steel High Pressure Kettle, 360 gal. cap.

1—Readco Stainless Steel Jacketed Double Arm Mixer, 150 gals. cap., with Sigma Blades.

4—11,000 gal. cap. Type 316 Stainless Steel Storage Tanks.

7—1,500 gal. cap. Type 316 Stainless Steel Storage Tanks.

5—Sharples #16-Y Stainless Steel Centrifuges.

1—Sperry Heresite Filter Press, 36" x 36", Plate and Frame, 4 Eye, Closed Delivery.

1—Abbe Engineering Silex-Lined Pebble Mill, 6' x 12'.

3—Mikro Pulverizers #1 SH.

1—Mikro Stainless Steel Pulverizer #2 TH.

3—Copper Columns, 36" x 80'.

1—J. H. Day #71 Re-Ball Jacketed Stainless Steel Gyrating Screen Cooler.

1—Buflovak Double Drum Dryer, 24" x 36".

3—Buflovak Flakers 5' x 12'.

1—Royal #1 Perforated Extruder, with heating unit.

4—Steel Heat Exchangers, 900 sq. ft. each

4—Sperry 36" x 36" Recessed Type Filter, center-feed, open-delivery, 42 Heresite covered Plates.

1—Sperry Aluminum Filter Press, 18" x 18", 9 Chambers.

1—Shriver Cast Iron Jacketed Plate & Frame Filter Press 36" x 48", 48 Chambers.

1—Sperry Aluminum Filter Press, 24" x 24", 22 Chambers.

1—Sparkler Stainless Steel Filter Model #10-S-12.

2—Shriver 36" x 36" Plate & Frame Filter Presses, 21 Chambers.

1—Shriver 36" x 36" Plate & Frame Filter Press, Closed Delivery, 35 Chambers.

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1 FEINC Rotary Vacuum Filter, string discharge, 4'0" dia x 6' face, aluminum.

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2 Pan Dryers or crystallizing Kettles, 10' dia. x 3' deep and 5' dia. x 30" deep.

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2 Read heavy duty double arm jacketed mixers, 200 gal. working cap.—1 stainless lined.

1 Read jacketed Ribbon Mixer, 80 gal.

1 Broughton Powder Mixer, double arm, 1400#.

4 Selectro Vibrating Screens, stainless steel, 3' x 7', double deck, enclosed.

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1 Byron Jackson Deep Well Pump, 150 GPM—325' head, NEW.

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1 Pfaudler 1 gal. Glass Lined Autoclave, 500# Pr., Agitated, Gas Fired.

1 Steel Autoclave, 120 gal., 22" dia. x 74" deep, 125# int. pr. 15# jkt. pr.

1 Steel Autoclave, 50 gal., 22" dia. x 30" deep, 200# int. pr. 100# jkt. pr., agitated.

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1—W&P 100-Gal. S.S. Mixer, sigma blade.
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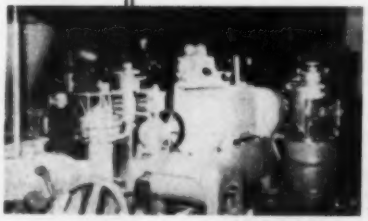


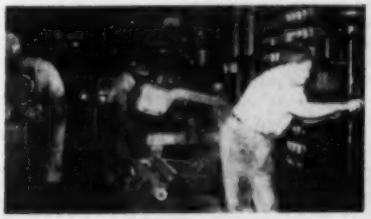
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(2) New Steel Vacuum JKTD. Receivers 125 Gal
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(2) Robinson DBL Attrition Mills 18" & 26"
(3) Abbe Pebble Mills Belgian Blocklined 60" x 72"
Abbe Pebble Mill Belgian Blocklined 54" x 60"
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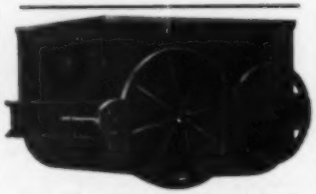
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H. LOEB & SON : - : 4643 LANCASTER AVE. PHILADELPHIA 31, PA.

BOILERS

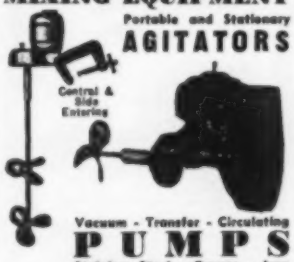
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Warthite		Cast Iron	
35	¾"	24	1"
13	1"	35	1½"
12	1½"	17	2"
2	3"	8	2½"
		4	3"

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1000—1/6 to 75 HP, Explosion, Totally Enclosed, Drip-proof

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Mulberry 4-6711

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We Buy For Cash
ARG CHEMICAL MACHINERY
POWER EQUIPMENT
P. O. BOX 2702 MEXICO D. F.

Wanted

500 to 1500 gallon nickel or nickel-clad
JACKETED KETTLE
AMERICAN CYANAMID CO.
Calco Chemical Division
WILLOW ISLAND, WEST VA.

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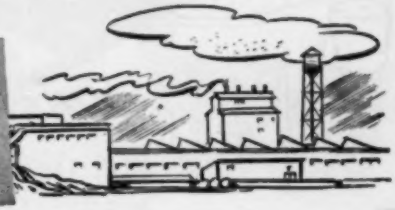
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McGRAW-HILL PUBLISHING CO., INC.
330 West 42nd Street
NEW YORK 18, N. Y.

GAS WORKS...



TEXTILE MILLS...



CHECK CORROSION FROM ACIDS AND ALKALIES LONGER WITH



Gas works . . . constantly exposed to corrosive fumes as well as weather, find the protection of rubber-base paints an important contribution to lower maintenance costs. Similarly, the textile industry uses rubber-base paints extensively because these paints resist acids and alkalies alike—help protect metal and concrete surfaces as well as equipment.

Continuing tests indicate that rubber-base paints will resist common causes of corrosion three to four times longer than ordinary protective coatings. Exceptionally satisfactory service results are obtained in numerous industries where surfaces are attacked by acids, alkalies, and salts.

Rubber-base paints dry fast and are easy to apply. They are especially durable on concrete because they resist abrasion and the free alkali in cements. Ask your paint supplier for details or write:

HERCULES POWDER COMPANY
Cellulose Products Department
952 Market Street, Wilmington, Delaware

RUBBER-BASE (PARLON)® PAINTS

CR51-3



1/8" HERE
BOTCHES THE BATCH BY A GALLON

Why risk it?

PUT IN ACCURATE, CLEAN NEPTUNE METERS AND

Inaccurate liquid measurements can add up to tremendous waste of materials, time, and effort—to say nothing of lost quality. For instance, it's tough to read a gauge stick down inside a 4-ft. tank, yet an error of just ⅛ in. means a whole gallon too much or too little liquid added.

MAKE EVERY BATCH PERFECT!



For formula-perfect batches time after time — automatically — put a Neptune Auto-Stop Meter in every liquid supply line. The operator pushes buttons to set the quantity desired, opens the valve, and the Auto-Stop shuts off at the right point—accurately—keeping your inventory and production figures for you as it goes along.

Neptunes have greater accuracy, longer life and lower maintenance because they're simpler, cleaner, precision built. Many types available for any liquids where sanitary or corrosion factors permit composition bronze. Sizes from ⅝" to 6" for up to 600 gpm.

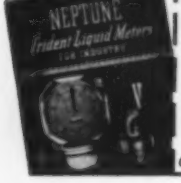


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We're interested in metering

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Company.....

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Here's Why it Pays You to Read the Advertising

The advertising is a rich source of valuable information. In this magazine it offers you ideas and products that may well apply advantageously to your business.

Every issue is a catalog of goods, materials, and services — quickly available to you—just for the reading.

Leaders in business and industry turn to the advertising because they've discovered it helps them run their businesses more profitably.

When you read all the ads in this magazine, the chances are good that you'll get a lead that will materially help you do a better job. For example, you may find a specific piece of equipment that will be a profitable time-saver. Or a tool that will increase worker efficiency. That's why it pays to read the advertising. It's good business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications





HERE'S A

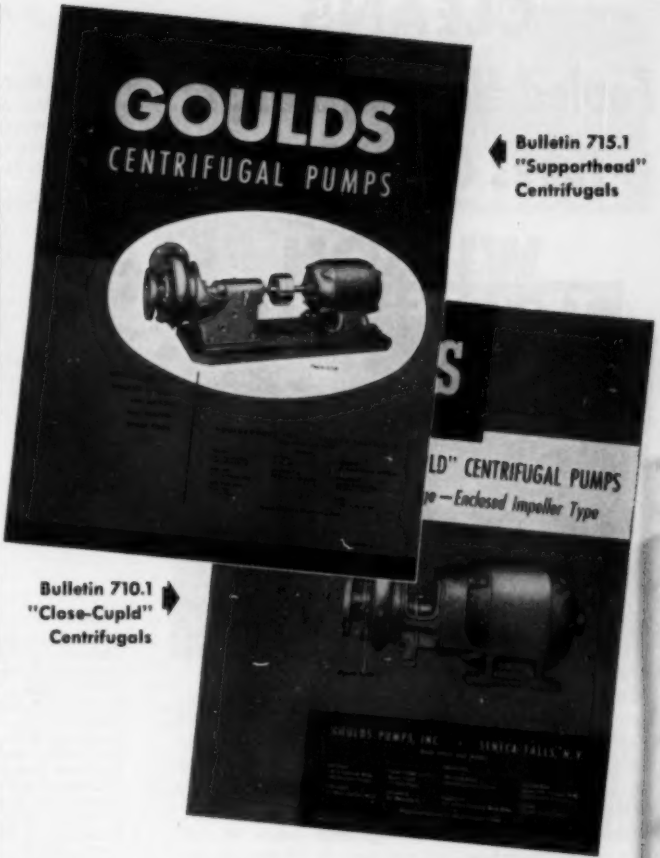
Parade

YOU WON'T WANT TO MISS...

Everybody loves a parade but here's one that's particularly interesting to YOU because it's packed with "pocket-book" appeal. It's a never-ending parade of products and services designed to help you do *your* job better, quicker and cheaper. You're in the "reviewing stand" for this parade because it comes to you in the advertising pages of every issue of this magazine. Alert manufacturers use these advertising pages to get the *news* about their products and services to *you*... quickly and effectively. To be well-informed about the latest developments in *your* industry... and to stay well-informed..., *read all the ads* too.

McGRAW-HILL PUBLICATIONS





Bulletin 715.1 "Supporthead" Centrifugals

Bulletin 710.1 "Close-Cupld" Centrifugals

These new bulletins make it easier for you to select the right pump

These new bulletins have been designed to help you. New sizes are listed, and, in each bulletin we have put a composite rating chart which includes both "Close-Cupld" and the supporthead. This makes it dead simple to put your finger on the right pump for your requirements.

Another valuable feature of these bulletins is the parts chart. Using this you see exactly what parts are interchangeable for all size pumps and so can keep your spare parts investment to a minimum.

Use the coupon below to send for these useful FREE bulletins *today*. Goulds Pumps, Inc., Seneca Falls, N. Y.

Goulds PUMPS INC. Seneca Falls New York

GOULDS PUMPS, INC.
Dept. CE , Seneca Falls, N. Y.
Send Bulletin 710.1 ☐
Bulletin 715.1 ☐

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Company_____
Address_____
City_____ Zone___ State_____

CLEANS
Fouled Heat Exchanger Tubes QUICKLY...

WILSON
TP-301 CLEANER



This high speed tube cleaner is designed to increase output and minimize down-time. The improved Model TP-301 is the only tube cleaner which can remove deposits from completely plugged heat exchanger tubes . . . and other fouled straight tubes heretofore not considered practical to clean.

Many improvements, resulting from years of field experience, have been built into the new TP-301 cleaner.

- **MORE POWERFUL**—operating speed up to 3300 RPM at 90 psi utilizing 130 cfm.
- **LIGHTER WEIGHT**—only 15 lb.
- **SHORTER**—only 13" overall.
- **INCREASED CAPACITY**—from 3/8" up to 2½" or even 3" O.D. tubes up to 40 ft. in length.
- **LOW AIR PRESSURE**—operates on air pressure as low as 50 lb.
- **LOW HEAD ROOM NEEDED**—minimum practical working head room 5 ft.
- **COSTS LESS** than previous models.

VARIOUS CARBIDE BITS AVAILABLE



Send for Bulletin giving complete details on this man-hour and money-saving tube cleaner

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CABLE "TUBECLEAN" NEW YORK

TW-704A

WILSON
TUBE CLEANERS · TUBE EXPANDERS

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WHITON LABYRINTH SHAFT SEAL . . . SINCE 1911

Whiton Turbines in service 25 years without seal replacement.

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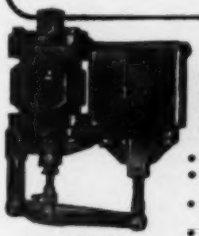
- Factory run-in assures perfect seal and minimum wear.
- Labyrinth seals do not contact shaft, eliminating wear and seizing.
- Steam ejector feature positively prevents steam leakage at outer end of shaft seal.

Write for complete details

WHITON MACHINE COMPANY
New London 14, Conn., U.S.A.

JOHNSON Direct Acting Solenoid Valve — for 150 lbs. Differential Pressure . . .

You *can* get a solenoid valve that operates under differential pressures up to 150 lbs., temperatures to 400° F., *without pilot valves.* It ends the time lag and wiredrawing that come with slow opening—the danger of sticking that comes with auxiliary pistons. Used for all types of automatic, or remote, flow control. Available for normally closed or normally open service; with stainless steel valve and seat or Jenkins disc; in sizes from ½" to 3".



WHERE CAN YOU USE THIS AUTOMATIC VALVE?

- No pilot valves
- Temperatures to 400° F.
- Differential Pressures to 150 lbs.
- Immediate full flow
- Heavy duty construction

Write for Bulletin "V"

The Johnson Corporation
848 WOOD ST. THREE RIVERS, MICHIGAN

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Chemical Engineering Reader Service

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TO MAKE IT HANDY

Products and literature in this issue are listed on these pages. There are two indexes. (1) editorial items on new equipment, new products, new literature; (2) products advertised. The index of advertisers is on the proceeding page.

NUMBERS EXPLAINED

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6	31	58–59b	85	104e	132	195	213n	248	B272	291c	314a	338a	L364b	388a	404e	419–420g	448	TL473	R490
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8b	34a	58–59e	86c	111	134–135b	199a	215	250b	B274	293	317	340	365a	390	406	421	451	474	L492
8c	34b	58–59f	86d	113	136–137a	199b	216	250c	275	294	318	341	365b	391	407	422	452a	475	R492
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10	35–38c	58–59i	88–89a	114c	136–137d	201	223	254	T280	BL296a	B320	345	366	392b	409b	423c	453	L478	L494
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